PB92-122969

Summary of Phase II Regulations: National Primary Drinking Water Regulation for 38 Inorganic and Synthetic Organic Chemicals

(U.S.) Environmental Protection Agency, Washington, DC

Oct 91

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office Of Water
(WH-550D)

570/9-91-022
October 1991

EPA

Summary Of Phase II Regulations

PB92-122969

Prepared for:

U.S. Environmental Protection Agency
Office of Ground Water and Drinking Water
Washington, DC 20460

Prepared as part of:

EPA Contract No. 68-C0-0069
Work Assignment No. 0-18

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

REPORT DOCUMENTATION PAGE

PB92-122969	2 REPORT DATE: October, 1991	3 REPORT TYPE AND DATES COVERED: Final

4 TITLE AND SUBTITLE
Summary of Phase II Regulations; National Primary Drinking Water Regulation for 38 Inorganic & Synthetic Organic Chemicals

5 FUNDING NUMBERS
C 68-C0-0069

6 AUTHOR(S)
Al Havinga (editor)

7 PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

8 PERFORMING ORGANIZATION REPORT NUMBER

9 SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Environmental Protection Agency
Office of Water (WH-550D)

10 SPONSORING/MONITORING AGENCY REPORT NUMBER
570/9-91-022

11 SUPPLEMENTARY NOTES

12a DISTRIBUTION/AVAILABILITY STATEMENT

12b

The U.S. Environmental Protection Agency promulgated National Primary Drinking Water Regulations for 38 inorganic and synthetic organic chemicals on January 30, 1991 and July 1, 1991. Collectively, these two rulemakings are referred to as the Phase II Rule. The following packet of materials summarizes the Phase II Rule and is intended for use by EPA regional officials, state and water system personnel. The first section of the package consists of a regulatory overview; the second section consists of a series of 14 fact sheets which describe specific aspects of the rule (i.e., monitoring and analytical requirements, state primacy conditions, public notification, treatment options, etc.); and the third section consists of contaminant-specific data sheets. The various components of the package have been designed to be used individually or as part of the larger package.

14 SUBJECT TERMS
Drinking Water Regulations
Phase II Rule, Synthetic Organic Chemicals
Inorganic Chemicals

15 NUMBER OF PAGES
67

16 PRICE CODE

17 SECURITY CLASSIFICATION OF REPORT	18 SECURITY CLASSIFICATION OF THIS PAGE	19 SECURITY CLASSIFICATION OF ABSTRACT	20 LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

Note to Reader

The U.S. Environmental Protection Agency promulgated National Primary Drinking Water Regulations for 38 inorganic and synthetic organic chemicals on January 30, 1991 and July 1, 1991. Collectively, these two rulemakings are referred to as the Phase II Rule. The following packet of materials summarizes the Phase II Rule and is intended for use by EPA regional officials, state and water system personnel. The first section of the package consists of a regulatory overview; the second section consists of a series of 14 fact sheets which describe specific aspects of the rule (i.e., monitoring and analytical requirements, state primacy conditions, public notification, treatment options, etc.); and the third section consists of contaminant-specific data sheets. The various components of the package have been designed to be used individually or as part of the larger package.

James R. Elder, Director
Office of Ground Water
and Drinking Water

This document is intended only to provide assistance to those charged with implementing the Phase II Rule. It does not establish or affect legal rights or obligations. It does not establish a binding norm and is not finally determinative of the issues addressed. The Phase II regulations in their entirety are, of course, controlling.

Table of Contents

Phase II Summary

Summary

Key Implementation Dates

Regulatory Impact

Phase II National Primary Drinking Water Regulations (Tables)

Compliance Monitoring Requirements (Table)

Regulatory Development Information

Phase II Fact Sheet Series

1. Standardized Monitoring Framework
2. Asbestos Monitoring
3. Nitrate Monitoring
4. Nitrite Monitoring
5. Inorganic Monitoring
6. Volatile Organic Chemical Monitoring
7. Pesticide Monitoring
8. Unregulated Contaminant Monitoring
9. Analytical Requirements
10. State Primacy Requirements
11. Public Notification
12. Treatment Options
13. Cost and Regulatory Impact
14. Secondary Standards

EPA Phase II Summary

National Primary Drinking Water Regulations for 38 Inorganic and Synthetic Organic Chemicals

October 1991

Summary

The January and July 1991 rulemakings:

- The January rulemaking promulgates Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs) or treatment technique requirements for 33 contaminants;
- The July rulemaking promulgates MCLGs and MCLs for aldicarb, aldicarb sulfoxide, aldicarb sulfone, pentachlorophenol, and barium; and
- The January rulemaking becomes effective in July 1992, and the July rulemaking becomes effective in January 1993.

When both rulemakings become effective:

- The addition of the 38 contaminants regulated under Phase II will raise the number of regulated contaminants to 64. Of the 38 Phase II contaminants, 27 are newly regulated. The remaining 11 contaminants were previously regulated and were revised.
- Phase II:
  - establishes 17 pesticide MCLs (12 new and five revised MCLs);
  - establishes eight inorganic MCLs (two new and six revised MCLs);
  - establishes 10 new volatile organic MCLs;
  - establishes a new MCL for PCBs;
  - establishes treatment technique requirements for two contaminants; and
  - deletes the MCL for silver.

These rules also include additional provisions for:

- Analytical methods and laboratory performance requirements;
- Best Available Technologies (BATs) for compliance with the MCLs and for the purpose of issuing variances;
- Secondary standards for silver (0.1 mg/L) and aluminum (0.05 to 0.2 mg/L) to address aesthetic considerations;
- Mandatory health effects language to be used by systems when notifying the public of violations; and
- State reporting, recordkeeping and primacy requirements.

Key Implementation Dates	
January 1991	Standards for 33 contaminants promulgated Standards for 5 contaminants reproposed
July 1991	Standards for 5 contaminants promulgated
July 1992	Standards for 33 contaminants effective
January 1993	Standards for 5 contaminants effective Monitoring for 38 contaminants begins

Regulatory Impact

- These regulations will reduce the exposure of three million consumers to the regulated contaminants and result in an estimated reduction of 75 cancer cases per year.
- Pesticides are expected to result in the most violations and the greatest costs and benefits.
- Total costs to all public water systems will be approximately $88 million per year ($64 million to treat and $24 million to monitor).
- Total state implementation costs will be $21 million initially and $17 million in future years.
- Additional monitoring will be required for 200,000 systems.
    - 80,000 community and nontransient, noncommunity systems must monitor for all contaminants.
    - 120,000 transient, noncommunity systems must monitor for nitrate and nitrite.
    - Monitoring requirements will be standardized to 3/6/9 year cycles.
    - Monitoring will generally cost less than $10 per household per year.
- Approximately 3300 or three percent of all public water systems will be required to provide treatment or find an alternate source of water.
    - Exemptions will be allowed for small systems based on costs.
    - Treatment will cost $10 to $800 per household depending upon system size, degree of contamination, and other factors.

Phase II National Primary Drinking Water Regulations

Contaminants	Drinking Water Health Effects	EPA Standards (mg/L)[1] Final MCLG	Final MCL	Current MCL	Sources	EPA Analytic Method[2]	BAT
Inorganics							
Asbestos	benign tumors	7 MFL [3]	7 MFL [3]	-	natural mineral deposits; also in Asbestos/Cement (A/C) pipe	TEM[4]	C/F; DF; DMF; CC
Barium	circulatory system	2	2	1	natural mineral deposits; oil/gas drilling operations; paint & other industrial uses	200.7, 208.1, 208.2	IE; LS; RO; ED
Cadmium	kidney	0.005	0.005	0.01	natural mineral deposits; metal finishing; corrosion product in plumbing	200.7, 213.1, 213.2	C/F; LS; RO; IE
Chromium	liver/kidney, skin, and digestive system	0.1	0.1	0.05	natural mineral deposits; metal finishing, textile, tanning and leather industries	200.7, 218.1, 218.2	C/F; LS; RO; IE
Mercury	kidney, nervous system	0.002	0.002	0.002	industrial/chemical manufacturing; fungicide; natural mineral deposits	245.1, 245.2	GAC; LS; C/F; RC
Nitrate	methemoglobinemia "blue-baby syndrome"	10	10	10	fertilizers, feedlots, sewage; naturally in soil, mineral deposits	300, 353.1, 353.2, 353.3	IE; RO; EDR
Nitrite	methemoglobinemia "blue-baby syndrome"	1	1	-	unstable, rapidly converted to nitrate; prohibited in working metal fluids	300, 353.2, 353.3, 354.1	IE; RO
Total Nitrate/Nitrite	----------	10	10	-	----------	----------	----------
Selenium	nervous system	0.05	0.05	0.01	natural mineral deposits; by-product of copper mining/smelting	270.2	EDR;C/F; AA;LS;RO

[1] Final MCLGs and MCLs become effective July 1992, except for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol. At that time, the current MCLs cease to be effective. The MCLs for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol become effective January 1993.

[2] Additional methods (other than EPA's) are permitted for the inorganic chemicals; consult the rule for more information.

[3] MFL = million fibers per liter, with fiber length >10 microns.

[4] TEM = Transmission Electron Microscopy

Phase II National Primary Drinking Water Regulations

Contaminants	Drinking Water Health Effects	EPA Standards (mg/L)[1] Final MCLG	Final MCL	Current MCL	Sources	EPA Analytic Method	BAT
Volatile Organics							
o-Dichlorobenzene	nervous system,lung, liver, kidney	0.6	0.6	-	industrial solvent; chemical manufacturing	502.1, 502.2, 503.1, 524.1, 524.2	All VOCs: GAC/PTA
cis-1,2-Dichloroethylene	nervous system, liver, circulatory	0.07	0.07	-	industrial extraction solvent	502.1, 502.2, 524.1, 524.2	
trans-1,2-Dichloroethylene	nervous system, liver, circulatory	0.1	0.1	-	industrial extraction solvent	502.1, 502.2, 524.1, 524.2	
1,2-Dichloropropane	probable cancer, liver, lungs, kidney	0	0.005	-	soil fumigant; industrial solvent	502.1, 502.2, 524.1, 524.2	
Ethylbenzene	kidney, liver, nervous system	0.7	0.7	-	present in gasoline & insecticides; chemical manufacturing	502.2, 503.1, 524.1, 524.2	
Monochlorobenzene	kidney, liver, nervous system	0.1	0.1	-	pesticide manufacturing; metal cleaner; industrial solvent	502.1, 502.2, 503.1, 524.1, 524.2	
Styrene	liver, nervous system	0.1	0.1	-	plastic manufacturing; resins used in water treatment equipment	502.2, 503.1, 524.1, 524.2	
Tetrachloroethylene	probable cancer	0	0.005	-	dry cleaning/industrial solvent	502.1, 502.2, 503.1, 524.1, 524.2	
Toluene	kidney, nervous system, lung	1	1	-	chemical manufacturing; gasoline additive; industrial solvent	502.2, 503.1, 524.1, 524.2	
Xylenes	liver, kidney, nervous system	10	10	-	paint/ink solvent; gasoline refining by-product; component of detergents	502.2, 503.1, 524.1, 524.2	

[1] Final MCLGs and MCLs become effective July 1992, except for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol. At that time, the current MCLs cease to be effective. The MCLs for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol become effective January 1993.

Phase II National Primary Drinking Water Regulations

Contaminants	Drinking Water Health Effects	EPA Standards (mg/L)[1] Final MCLG	Final MCL	Current MCL	Sources	EPA Analytic Method	BAT
Pesticides and PCBs							
Alachlor (Lasso)	probable cancer	0	0.002	-	herbicide on corn and soybeans; under review for cancellation	505, 507, 525.1	GAC
Aldicarb (Temik)	nervous system	0.001	0.003	-	insecticide on cotton, potatoes; restricted in many areas due to gw contamination	531.1	GAC
Aldicarb sulfoxide	nervous system	0.001	0.004	-	degraded from aldicarb by plants	531.1	GAC
Aldicarb sulfone	nervous system	0.001	0.002	-	degraded from aldicarb by plants	531.1	GAC
Atrazine (Atranex, Crisazina)	reproductive and cardiac	0.003	0.003	-	widely used herbicide on corn and on non-crop land	505, 507, 525.1	GAC
Carbofuran (Furadan 4F)	nervous system and reproductive	0.04	0.04	-	soil fumigant/insecticide on corn/cotton; restricted in some areas	531.1	GAC
Chlordane	probable cancer	0	0.002	-	soil insecticide for termite control on corn, potatoes; most uses cancelled in 1980	505, 508, 525.1	GAC
Dibromochloropropane (DBCP, Nemafume)	probable cancer	0	0.0002	-	soil fumigant on soybeans, cotton; cancelled in 1977	504	GAC/PTA
2,4-D (Formula 40, Weedar 64)	liver, kidney, nervous system	0.07	0.07	0.1	herbicide for wheat, corn, rangelands	515.1	GAC
Ethylene dibromide (EDB, Bromofume)	probable cancer	0	0.00005	-	gasoline additive; soil fumigant; solvent; cancelled in 1984; limited uses continue	504	GAC/PTA
Heptachlor (H-34, Heptox)	probable cancer	0	0.0004	-	insecticide on corn; cancelled in 1983 for all but termite control	505, 508, 525.1	GAC
Heptachlor epoxide	probable cancer	0	0.0002	-	soil & water organisms convert heptachlor to the epoxide	505, 508, 525.1	GAC

[1] Final MCLGs and MCLs become effective July 1992, except for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol. At that time, the current MCLs cease to be effective. The MCLs for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol become effective January 1993.

Phase II National Primary Drinking Water Regulations

Contaminants	Drinking Water Health Effects	EPA Standards (mg/L)[1] Final MCLG	Final MCL	Current MCL	Sources	EPA Analytic Method	BAT
Pesticides and PCBs (cont'd)							
Lindane	nervous system, liver, kidney	0.0002	0.0002	0.004	insecticide for seed, lumber, livestock; pest control; most uses restricted in 1983	505, 508, 525.1	GAC
Methoxychlor (DMDT, Marlate)	nervous system, liver, kidney,	0.04	0.04	0.1	insecticide on alfalfa, livestock	505, 508, 525.1	GAC
Polychlorinated biphenyls (PCBs, Aroclor)	probable cancer	0	0.0005	-	electrical transformers, plasticizers; banned in 1979	505 and 508 (screen), 508A (quantitate)	GAC
Pentachlorophenol	probable cancer, liver, kidney	0	0.001	-	wood preservative & herbicide; non-wood uses banned in 1987	515.1, 525.1	GAC
Toxaphene	probable cancer	0	0.003	0.005	insecticide/herbicide for cotton, soybeans; cancelled in 1982	505, 508, 525.1	GAC/ PTA
2,4,5-TP (Silvex)	nervous system, liver, kidney	0.05	0.05	0.01	herbicide on rangelands, sugarcane, golf courses; cancelled in 1983.	515.1	GAC
Treatment Techniques							
Acrylamide	probable cancer, nervous system	0	0.05% dosed at 1 mg/L		flocculents in sewage/ wastewater treatment	none	PAP
Epichlorohydrin	probable cancer, liver, kidney, lungs	0	0.01% dosed at 20 mg/L		epoxy resins & coatings, flocculents used in treatment	none	PAP

Best Available Technology Key:

AA = Activated Alumina	EDR = Electrodialysis Reversal	LS = Lime Softening
C/F = Coagulation/Filtration	CC = Corrosion Control	RO = Reverse Osmosis
DF = Direct Filtration	GAC = Granular Activated Charcoal	PAP = Polymer Addition Practices
DMF = Diatomite Filtration	IE = Ion Exchange	PTA = Packed Tower Aeration

[1] Final MCLGs and MCLs become effective July 1992, except for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol. At that time, the current MCLs cease to be effective. The MCLs for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol become effective January 1993.

Compliance Monitoring Requirements

Contaminant	Base Requirement		Trigger that Increases Sampling	Waivers for Base Requirements
	Ground water	Surface water		
Asbestos	1 Sample every 9 years		> MCL	YES Based on VA[1]
Nitrate	Annual	Quarterly	≥ 50% MCL	NO
	After 1 year < 50% of MCL, SWS may reduce to an annual sample			
Nitrite	1 Sample: If < 50% of MCL, state discretion		≥ 50% MCL	NO
5 Inorganics	1 Sample every 3 years	Annual sample	> MCL	YES Based on analytical results of 3 rounds
18 VOCs	4 Quarterly samples every 3 years Annual after 1 year of no detects		> 0.0005 mg/L	YES Based on VA[1]
17 Pesticides and PCBs	4 Quarterly samples every 3 years After 1 round of no detects: systems >3300 reduce to 2 samples per year every 3 years; systems ≤ 3300 reduce to 1 sample every 3 years		Method Detection Limit (MDL)	YES Based on VA[1]
Unregulated - 6 IOCs - 24 SOCs	1 Sample 4 Consecutive quarterly samples		N.A.	YES Based on VA[1]

[1] VA = Vulnerability Assessment

Regulatory Development

Date	Action	Cite
May 22, 1989	Proposed MCLGs, MCLs, and treatment technique requirements for 38 contaminants	(54 *FR* 22062)
January 30, 1991	Final MCLGs, MCLs, and treatment technique requirements for 33 contaminants	(56 *FR* 3526)
January 30, 1991	Proposed MCLGs and MCLs for five contaminants	(56 *FR* 3600)
July 1, 1991	Final MCLGs and MCLs for five contaminants	(56 *FR* 30266)

For More Information

EPA Regional Offices

EPA Region 1
Groundwater Management and Water Supply Branch
JFK Federal Building
Boston, MA 02203
(617) 565-3610

Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont

EPA Region 2
Drinking Water/Groundwater Protection Branch
26 Federal Plaza
New York, NY 10278
(212) 264-1800

New Jersey, New York, Puerto Rico, Virgin Islands

EPA Region 3
Drinking Water/Groundwater Protection Branch
841 Chestnut Street
Philadelphia, PA 19107
(215) 597-8227

Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia

EPA Region 4
Municipal Facilities Branch
345 Courtland Street, N.E.
Atlanta, GA 30365
(404) 347-2207

Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

EPA Region 5
Safe Drinking Water Branch
230 South Dearborn Street
Chicago, IL 60604
(312) 353-2151

Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

EPA Region 6
Water Supply Branch
1445 Ross Avenue
Dallas, TX 75202
(214) 655-7150

Arkansas, Louisiana, New Mexico, Oklahoma, Texas

EPA Region 7
Drinking Water Branch
726 Minnesota Avenue
Kansas City, KS 66101
(913) 551-7032

Iowa, Kansas, Missouri, Nebraska

EPA Region 8
Drinking Water Branch
999 18th Street
Denver, CO 80202
(303) 293-1413

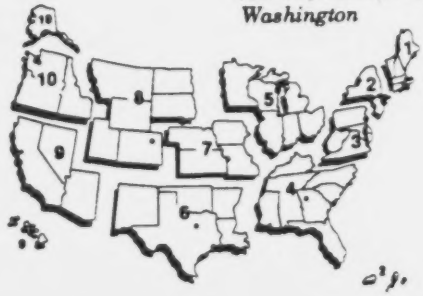
Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

EPA Region 9
Drinking Water/Groundwater Protection Branch
75 Hawthorne Street
San Francisco, CA 94105
(415) 744-2250

Arizona, California, Hawaii, Nevada, American Samoa, Guam, Trust Territories of the Pacific

EPA Region 10
Drinking Water Programs Branch
1200 Sixth Avenue
Seattle, WA 98101
(206) 553-1223

Alaska, Idaho, Oregon, Washington



EPA Safe Drinking Water Hotline
☎ 1-800-426-4791

Phase II Fact Sheet Series

1. Standardized Monitoring Framework
2. Asbestos Monitoring
3. Nitrate Monitoring
4. Nitrite Monitoring
5. Inorganic Monitoring
6. Volatile Organic Chemical Monitoring
7. Pesticide Monitoring
8. Unregulated Contaminant Monitoring
9. Analytical Requirements
10. State Primacy Requirements
11. Public Notification
12. Treatment Options
13. Cost and Regulatory Impact
14. Secondary Standards

EPA Standardized Monitoring Framework

EPA Phase II Fact Sheet Series (1 of 14)

October 1991

This fact sheet summarizes the U.S. Environmental Protection Agency's (EPA) Standardized Monitoring Framework as promulgated under the Agency's Phase II Rule. Monitoring in accordance with the framework begins in January 1993.

Purpose

The primary objective of the Standardized Monitoring Framework is to reduce the variability and complexity of drinking water monitoring requirements. The objective is achieved through the standardization of monitoring requirements and the synchronization of monitoring schedules across "rules" and contaminant groups.

Applicability

The Standardized Monitoring Framework currently applies to the 38 contaminants contained in EPA's Phase II Rule. However, the framework was designed to eventually apply to most source-related contaminants including volatile organic chemicals, pesticides, inorganic chemicals, and radionuclides. Subsequent regulations issued by EPA for such contaminants will, in general, contain monitoring requirements that "fit" or fall within the Standardized Monitoring Framework. In general, the Standardized Monitoring Framework applies to all community water systems and all nontransient, noncommunity water systems. For some contaminants (i.e., nitrate and nitrite), the Standardized Monitoring Framework also applies to transient, noncommunity water systems.

Standardized Monitoring Framework

Compliance Cycle 1

- **Period 1** *(1993, 1994, 1995)*
- **Period 2** *(1996, 1997, 1998)*
- **Period 3** *(1999, 2000, 2001)*

Compliance Cycle 2

- **Period 1** *(2002, 2003, 2004)*

↓ *to 2010*

The Framework

To standardize monitoring requirements across rules and contaminant groups, EPA has established a ***nine-year*** (based on a calendar year) ***compliance "cycle,"*** with the first cycle beginning on January 1, 1993. The nine year compliance cycle contains three ***three-year compliance "periods."*** The first three-year compliance period extends from 1993 to 1995, the second period from 1996 to 1998, and the third from 1999 to 2001. The second nine-year compliance cycle begins in 2002 and extends through 2010.

The Standardized Monitoring Framework encompasses both sampling and vulnerability assessment activities. The framework provides states the flexibility to determine at which point in a compliance period systems must conduct sampling activities. EPA is requiring states to schedule one-third of their systems for sampling in 1993, another one-third in 1994, and the final one-third in 1995. States may wish to prioritize sampling based on system size, vulnerability, lab capacity, and/or community/noncommunity criteria. Once a

system is scheduled to sample within a particular three-year compliance period (e.g., the second year in the compliance period), the system must then sample in the same year in subsequent compliance periods (e.g., the second year).

Initial sampling for contaminants under EPA's Phase II Rule begins in the three-year compliance period starting January 1, 1993. Repeat sampling for applicable systems is to take place during the compliance periods 1996 to 1998 and 1999 to 2001. In subsequent EPA regulations, the initial sampling period for contaminants will be during the first full three-year compliance period following the effective date of the rule (i.e., 18 months after the date of promulgation). For example, if Phase V (covering additional inorganic and synthetic organic chemicals) is promulgated in March 1992, the effective date of the rule would be September 1993 (the middle of a compliance period). The initial round of sampling for Phase V contaminants would then take place during the 1996 to 1998 compliance period.

Specific Standardized Monitoring Requirements

(To learn how these requirements are applied to the 38 contaminants covered under the Phase II Rule, consult Fact Sheets 2 through 8 of EPA's Phase II Fact Sheet Series.)

- All systems must sample at a base (or minimum) sampling frequency which is specified by EPA for each contaminant or group of contaminants unless a waiver has been granted by the state (see waiver section below).
- Initial base sampling requirements are the same for all systems regardless of system size or water source, except for the Phase II inorganic contaminants.
- Repeat base sampling requirements are generally the same for all systems regardless of system size and water source, with the exception of pesticides. Generally, repeat base sampling requirements can be reduced if initial sampling results in no detects of a contaminant.
- All systems which "detect" a contaminant must conduct quarterly sampling until the state determines that the analytical results are "reliably and consistently" below the maximum contaminant level (MCL). Detection is defined separately for each contaminant or group of contaminants at either the MCL, 50 percent of the MCL, or at the analytical method detection limit (MDL). After detection, groundwater systems must take a minimum of two quarterly samples and surface water systems must take a minimum of four quarterly samples before the state can determine that the analytical results are "reliably and consistently" below the MCL.
- "Reliably and consistently" below the MCL means that though a system detects contaminants in its water supply, it has sufficient knowledge of the source or extent of the contamination to predict that the MCL would not be exceeded in the future. Wide variations in the analytical results or an analytical result which is close to the MCL are examples of situations where systems would not meet the "reliably and consistently" test.

Grandfathering of Data

- Sampling data collected three years prior to the beginning of an initial three-year compliance period may be used to satisfy a system's initial

sampling requirements. Such "grandfathering of data" would enable an eligible system to sample at repeat frequencies which are generally lower than initial frequencies.

- Vulnerability assessments may not be grandfathered.

Waivers

- Waivers of sampling requirements are available to all systems and are based upon a vulnerability assessment and/or the analytical results of previous sampling.
- Waiver determinations are to be made by the state on a contaminant-specific basis.
- Vulnerability assessments may be conducted by the state, a system, or a third-party organization. States are to approve all assessments.
- Systems which do not receive waivers must sample at required base frequencies.
- There are two basic types of waivers:

  1) **Waiver by Rule:** Systems meet EPA-specified criteria (i.e., three analytical results less than the MCL).

  2) **Waiver by Vulnerability Assessment** (two-step process):

  Step 1—Use Waiver: A determination is made whether a given contaminant was used, manufactured, and/or stored in a system area. If the answer to the inquiry is yes or unknown, the system is "susceptible" to contamination and a "use waiver" cannot be granted.

  Step 2—Susceptibility Waiver: If a "use waiver" cannot be granted, a system may conduct a thorough vulnerability assessment of the water source to determine the system's "susceptibility" to contamination. Susceptibility is to be based on: a) prior analytical and/or vulnerability assessment results, b) environmental persistence and transport of the contaminant, c) how well the source is protected, d) wellhead protection program reports, and e) elevated nitrate levels.

  Systems with no known "susceptibility" to contamination (based upon an assessment of the above factors), may be granted a "susceptibility waiver." If "susceptibility" cannot be determined, a system is not eligible for a waiver and must sample at the regulatory minimum or base sampling frequency.

EPA Asbestos Monitoring

EPA Phase II Fact Sheet Series (2 of 14)

October 1991

This fact sheet summarizes the monitoring requirements for asbestos as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. Monitoring for asbestos begins in January 1993.

Systems Affected

All community water systems (CWS) and nontransient, noncommunity water systems (NTWS) must comply with the monitoring requirements for asbestos.

Sampling Points

1) If asbestos occurs in the source water, sampling must be conducted at each entry point to the distribution system which is representative of the well or source water after treatment.
2) Systems that are vulnerable to asbestos contamination, either due to asbestos-cement pipe and/or the corrosivity of the water and source water conditions, shall take one sample at a tap served by asbestos-cement pipe and under conditions where asbestos contamination is most likely to occur.

Initial Base Sampling

Between 1993 and 1995, all systems must take one sample at each sampling point unless a waiver has been granted by the state (see below for summary of waiver requirements). The state will designate the year in which each system samples within this compliance period.

Grandfathering

States may allow previous sampling data to satisfy the initial base sampling requirements, provided the sampling data was collected after January 1, 1990.

Repeat Base Sampling

If results of the initial sample do not exceed the maximum contaminant level (MCL) for asbestos, then the system would not be required to take repeat samples until the start of the next nine-year compliance cycle (2002 to 2005).

Trigger for Increased/Decreased Sampling

The MCL for asbestos is the trigger for increased/decreased sampling (see sidebar for the MCL).

Regulated Contaminant

Contaminant
Asbestos

MCL
7 Million Fibers/Liter (MFL)—(longer than 10 micrometers)

Increased Sampling (if MCL is exceeded)

1) Any system exceeding the MCL for asbestos must take quarterly samples (in the quarter immediately following the violation). A system must continue quarterly sampling until a baseline is established (minimum of two quarters for ***groundwater systems*** and four quarters for ***surface water systems***).
2) If the state determines that the baseline is "reliably and consistently" below the MCL, the sampling frequency may be reduced to the base requirements.

Confirmation Samples

States may require a confirmation sample for any sample that exceeds the MCL. These confirmation samples must be taken within two weeks from the same sampling point and as soon as possible after the initial sample. If a confirmation sample is used, compliance is based on the average of the results of both the confirmation and initial samples.

Compliance Determination

1) If a system samples more frequently than annual (i.e., quarterly), the system would be in violation if the running annual average at any sampling point exceeds the MCL.
2) If a system samples on an annual or less frequent basis (i.e., every three years), the system would be in violation if one sample (or the average of the initial and confirmation samples) at any point exceeds the MCL.

Public Notice

A system in violation of the National Primary Drinking Water Regulation (i.e., MCL, monitoring and reporting requirements, etc.) for asbestos must give public notice. For a MCL violation, systems must issue a public notice that includes the specific mandatory health effects language contained in the Phase II Rule. Systems must publish the notice in the newspaper within 14 days and deliver the notice to consumers within 45 days. For monitoring violations, systems must notify consumers through major newspapers within three months. Follow-up notices must be issued every three months for the duration of any violation. NTWS have additional options of hand delivering or continuously posting public notices instead of using the above delivery routes.

Compositing

Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

States may grant a waiver if, on the basis of a vulnerability assessment, the system determines it is not vulnerable to asbestos contamination. The state may grant a waiver based on consideration of the following factors:

1) potential asbestos contamination of the water source and
2) the use of asbestos-cement pipe for finished water distribution **and** the corrosive nature of the water.

If the state grants a waiver, base sampling requirements are eliminated. Waivers are effective for one three-year compliance period. A new waiver is required in the first compliance period of each nine-year compliance cycle. If waivers are not renewed, systems must sample according to base requirements (i.e., one sample at each sampling point every nine years).

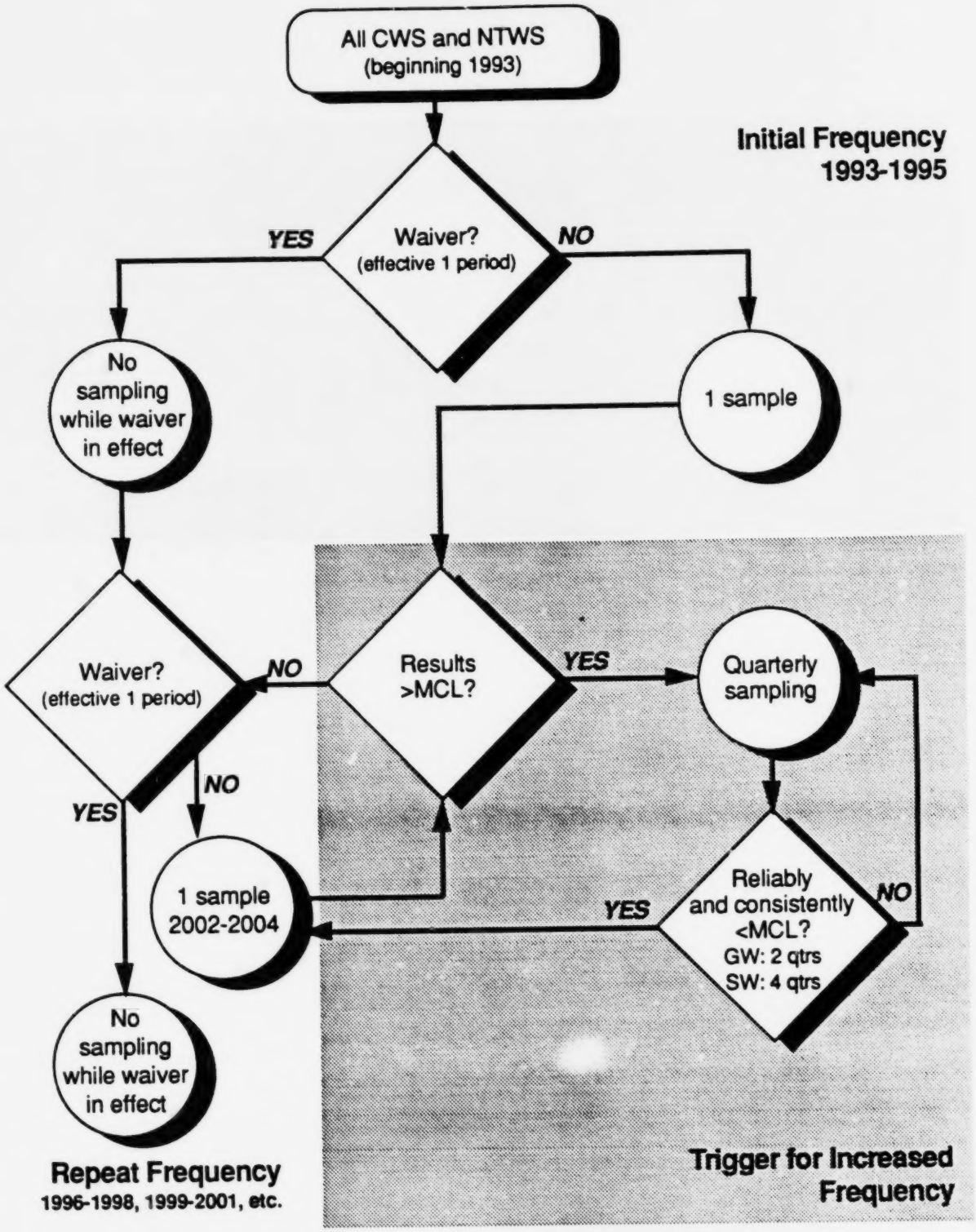
Standardized Monitoring Framework: **Asbestos** (CWS and NTWS)

	CALENDAR YEAR		BASE REQUIREMENTS	WAIVERS (ALL SYSTEMS)
	1991			
	1992			
First 9 - year Compliance Cycle	1993	Initial Monitoring Round	1 sample at each sampling point	Yes: Waivers Based on Vulnerability Assessment (No Samples Required)
	1994			
	1995			
	1996	Repeat Monitoring	No Requirements	Not Applicable
	1997			
	1998			
	1999	Repeat Monitoring	No Requirements	Not Applicable
	2000			
	2001			
Begins Second 9 - year Cycle	2002	Repeat Monitoring Round	1 sample at each sampling point	Yes: Waivers Based on Vulnerability Assessment
	2003			
	2004			

NOTES

- States will designate the year during each compliance period in which each system must sample.
- EPA is requiring states to schedule one-third of their systems for sampling in 1993, another one-third in 1994, and the final one-third in 1995.

Asbestos Monitoring Flow Chart



EPA Nitrate Monitoring

EPA Phase II Fact Sheet Series (3 of 14)

October 1991

This fact sheet summarizes revised monitoring requirements for nitrate as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. The revised monitoring requirements for nitrate take effect in January 1993.

Systems Affected

All community water systems (CWS), transient and nontransient, noncommunity water systems (TWS and NTWS, respectively) must comply with the monitoring requirements for nitrate.

Sampling Points

Sampling must be conducted at each entry point to the distribution system. Sampling points must be representative of the well or source water after treatment.

Initial Base Sampling

All water systems must begin complying with the revised sampling requirements for nitrate beginning January 1, 1993. The frequency of initial sampling is as follows:

CWS and NTWS: Groundwater systems must sample annually while ***surface water systems*** must sample quarterly.

TWS: All systems regardless of the water source must sample annually.

Grandfathering

Not allowed.

Trigger for Increased/Decreased Sampling

Any sample greater than or equal to (≥) 50 percent of the MCL triggers the need for increased sampling. Analytical results less than (<) 50 percent of the MCL for a minimum of one round of sampling can trigger decreased sampling requirements. ***The trigger is not applicable to transient, noncommunity water systems.*** (See sidebar for MCL and trigger level.)

Repeat Base Sampling (<50% MCL)

CWS and NTWS: Groundwater systems must continue sampling on an annual basis as during the initial sampling phase. States may reduce the sampling frequency to annual for ***surface water systems*** provided the analytical results from four consecutive quarters are less than (<) 50 percent of the MCL (i.e., 5 mg/L). For systems sampling annually, repeat samples must be taken during the quarter(s) which previously yielded the highest analytical results.

TWS: Same as initial sampling requirements (i.e., annual).

Regulated Contaminant

MCL
10 mg/L (as Nitrogen)

Trigger
5 mg/L (as Nitrogen)

Increased Sampling (≥ 50% MCL or ≥ MCL)

CWS and NTWS: Systems collecting any sample(s) greater than or equal to (≥) 50 percent of the MCL must sample on a quarterly basis. States have the discretion to decrease the sampling frequency to annual for ***groundwater systems*** provided the results of four consecutive quarterly samples are "reliably and consistently" below the MCL. States may reduce the sampling frequency to annual for ***surface water systems*** provided the analytical results from four consecutive quarters is less than (<) 50 percent of the MCL.

TWS: Same as initial sampling requirements (i.e., annual).

Confirmation Samples

Systems must take a confirmation sample within 24 hours after the results of the initial sample are found to be greater than or equal to (≥) the MCL. Systems unable to meet the 24-hour confirmation sampling requirement must issue a public notice to consumers of the system and must then analyze a confirmation sample within two weeks of receiving the results of the initial sample.

Compliance Determination

If any sample exceeds the MCL for nitrate, systems must take a confirmation sample. The compliance determination is based on the average of the results of the initial and confirmation samples.

Public Notice

Any system violating the National Primary Drinking Water Regulation (i.e., MCL, monitoring and reporting requirements, etc.) for nitrate must give public notice. For a violation of the MCL, a system must 1) give notice by electronic media (e.g., TV, radio) within 72 hours, 2) publish a notice in the newspaper within 14 days, and 3) deliver a notice to each consumer within 45 days. The notice must include the specific mandatory health effects language contained in the Phase II Rule. The public notice requirements also apply to systems unable to take confirmation samples within a 24-hour time period (see confirmation sample section above). For monitoring violations, a system must notify consumers via newspaper within three months. Follow-up notices must be issued every three months for the duration of any violation. NTWS and TWS have an additional option of posting public notices instead of using the above delivery routes.

Compositing

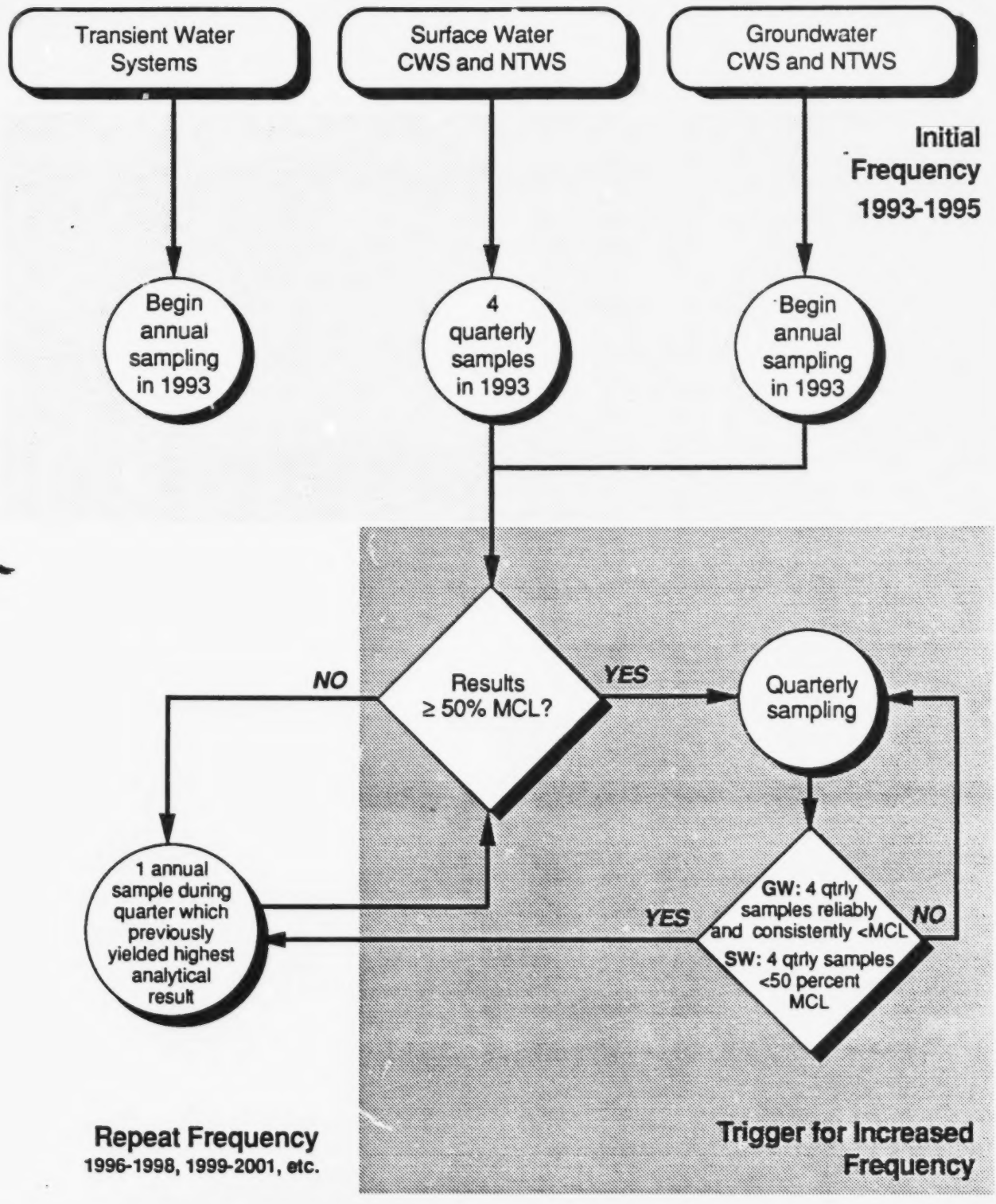
Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

Not allowed.

Nitrate Monitoring Flow Chart



EPA Nitrite Monitoring

EPA Phase II Fact Sheet Series (4 of 14)

October 1991

This fact sheet summarizes the monitoring requirements for nitrite as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. Monitoring for nitrite begins in January 1993.

Systems Affected

All community water systems (CWS), transient and nontransient, noncommunity water systems (TWS and NTWS, respectively) must comply with the monitoring requirements for nitrite.

Sampling Points

Sampling must be conducted at each entry point to the distribution system. Sampling points must be representative of the well or source water after treatment.

Initial Base Sampling

Between 1993 and 1995, each system must take one sample. The state will designate the year in which each system samples within this compliance period.

Grandfathering

Not allowed.

Trigger for Increased/Decreased Sampling

The trigger for increased/decreased sampling for nitrite is 50 percent of the MCL (i.e., 0.5 mg/L). (See sidebar for MCL and trigger level.)

Repeat Base Sampling (<50% MCL)

If the results of initial sampling are less than (<) 50 percent of the MCL, repeat sampling requirements (if any) will be at state discretion.

Increased Sampling (≥50% MCL or ≥MCL)

1) Systems collecting any sample(s) greater than or equal to (≥) 50 percent of the MCL must sample quarterly for at least one year.
2) States may decrease the sampling frequency to annual provided the results of four consecutive quarterly samples are "reliably and consistently" below the MCL.

Regulated Contaminant
MCL 1 mg/L (as Nitrogen)
Trigger 0.5 mg/L (as Nitrogen)

3) Systems sampling annually must take subsequent samples during the quarter(s) which previously yielded the highest analytical result(s).

Confirmation Samples

Systems must take a confirmation sample within 24 hours after the results of the initial sample are found to be greater than or equal to (≥) the MCL. Systems unable to meet the 24-hour confirmation sampling requirement must issue a public notice to consumers of the system and must then analyze a confirmation sample within two weeks of receiving the results of the initial sample.

Compliance Determination

If any sample exceeds the MCL for nitrite, systems must take a confirmation sample. The compliance determination is based on the average of the results of the initial and confirmation samples.

Public Notice

Any system violating the National Primary Drinking Water Regulation (i.e., MCL, monitoring and reporting requirements, etc.) for nitrite must give public notice. For a violation of the MCL, a system must 1) give notice by electronic media (e.g., TV, radio) within 72 hours, 2) publish a notice in the newspaper within 14 days, and 3) deliver a notice to each consumer within 45 days. The notice must include the specific mandatory health effects language contained in the Phase II Rule. The public notice requirements also apply to systems unable to take confirmation samples within a 24-hour time period (see confirmation sample section above). For monitoring violations a system must notify consumers via newspaper within three months. Follow-up notices must be issued every three months for the duration of any violation. NTWS and TWS have an additional option of posting public notices instead of using the above delivery routes.

Compositing

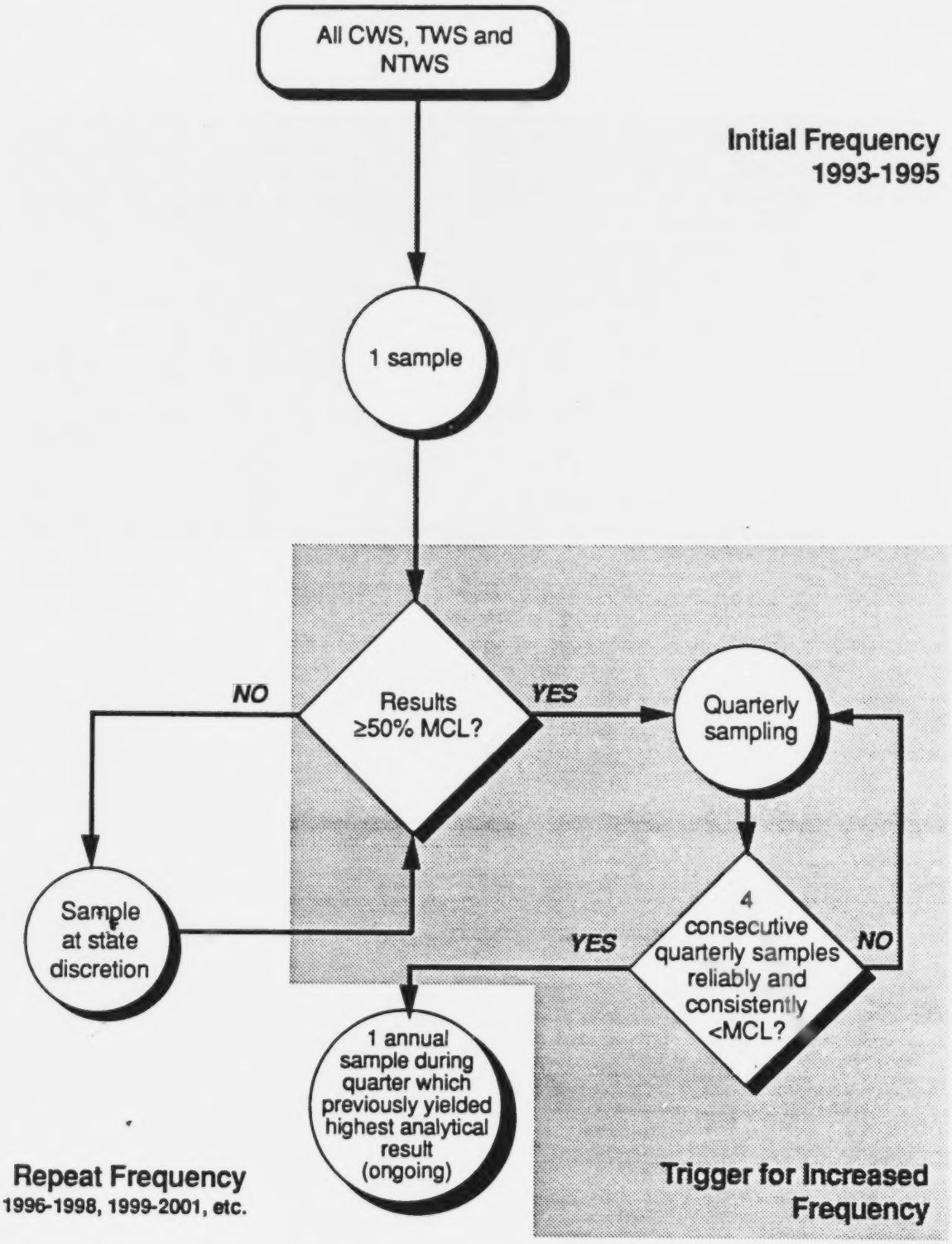
Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

Not allowed.

Nitrite Monitoring Flow Chart



EPA Inorganic Monitoring

EPA Phase II Fact Sheet Series (5 of 14)

October 1991

This fact sheet summarizes the monitoring requirements for five inorganic chemicals (barium, cadmium, chromium, mercury, and selenium) as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. Monitoring for these contaminants begins in January 1993.

Systems Affected

All community water systems (CWS) and nontransient, noncommunity water systems (NTWS) must comply with the monitoring requirements for barium, cadmium, chromium, mercury, and selenium.

Sampling Points

Sampling must be conducted at each entry point to the distribution system. Sampling points must be representative of the well or source water after treatment.

Initial Base Sampling

Groundwater systems must take one sample during the compliance period 1993 to 1995. The state will designate the year in which each system must sample within this compliance period. ***Surface water systems*** must sample annually beginning in 1993. Waivers from sampling may be granted by the state (see below for a summary of waiver requirements).

Grandfathering

States may allow previous sampling data to satisfy the initial base sampling requirements, provided at least one sample was taken after January 1, 1990.

Repeat Base Sampling

Repeat base sampling requirements are the same as those for the initial base phase unless a waiver has been granted by the state (i.e., one sample per three-year compliance period for ***groundwater*** and one sample each year for ***surface water systems***).

Trigger for Increased Sampling

The maximum contaminant level (MCL) for each inorganic chemical triggers the requirement for increased sampling (see sidebar text for list of contaminants and their corresponding MCLs).

Regulated Contaminants

Contaminant	MCL (mg/L)
Barium	2
Cadium	0.005
Chromium	0.1
Mercury	0.002
Selenium	0.05

Increased Sampling

1) Any system exceeding the MCL for a given contaminant must take quarterly samples (in the quarter immediately following the violation) until a baseline is established (minimum of two quarters for ***groundwater systems*** and four quarters for ***surface water systems***).
2) If the state determines that the baseline is "reliably and consistently" below the MCL, the sampling frequency may be reduced to the base requirements.

Confirmation Samples

States may require a confirmation sample for any sample that exceeds the MCL. These confirmation samples must be taken within two weeks from the same sampling point and as soon as possible after the initial sample. If a confirmation sample is used, compliance is based on the average of the results of the initial and confirmation samples.

Compliance Determination

1) If a system samples more frequently than annual (i.e., quarterly), the system would be in violation if the running annual average at any sampling point exceeds the MCL.
2) If a system conducts sampling on an annual or less frequent basis, the system would be in violation if one sample (or the average of the initial and confirmation samples) at any point exceeds the MCL.

Public Notice

Any system violating the National Primary Drinking Water Regulation (i.e., MCL, monitoring and reporting requirements, etc.) for one or more of the five inorganic chemicals must give public notice. For a MCL violation, systems must issue a public notice that includes the specific mandatory health effects language contained in the Phase II Rule. Systems must publish the notice in the newspaper within 14 days and deliver the notice to consumers within 45 days. For monitoring violations, systems must notify consumers through major newspapers within three months. Follow-up notices must be issued every three months for the duration of any violation. NTWS have additional options of hand delivering or continuously posting public notices instead of using the above delivery routes.

Compositing

Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

States may grant "waivers by rule" to systems that are effective up to nine years (or one compliance cycle) for each of the five inorganic contaminants. In order to qualify for a waiver, a system must have three previous compliance samples (including one taken after January 1, 1990), and all previous analytical results must be below the MCL (see grandfathering section above). The waiver must be granted at the beginning of the year in which the system is scheduled to sample, otherwise the system is subject to base sampling requirements. As a condition of the waiver, systems must take at least one sample during the nine-year waiver period.

The state must consider the following in making the "waiver by rule" determination:

1) reported concentrations from all previous monitoring,
2) degree of variation in reported concentrations, and
3) other factors which may affect contaminant concentrations (i.e., groundwater pumping rates, changes in the system's configuration, changes in the system's operating procedures, or changes in stream flows or characteristics).

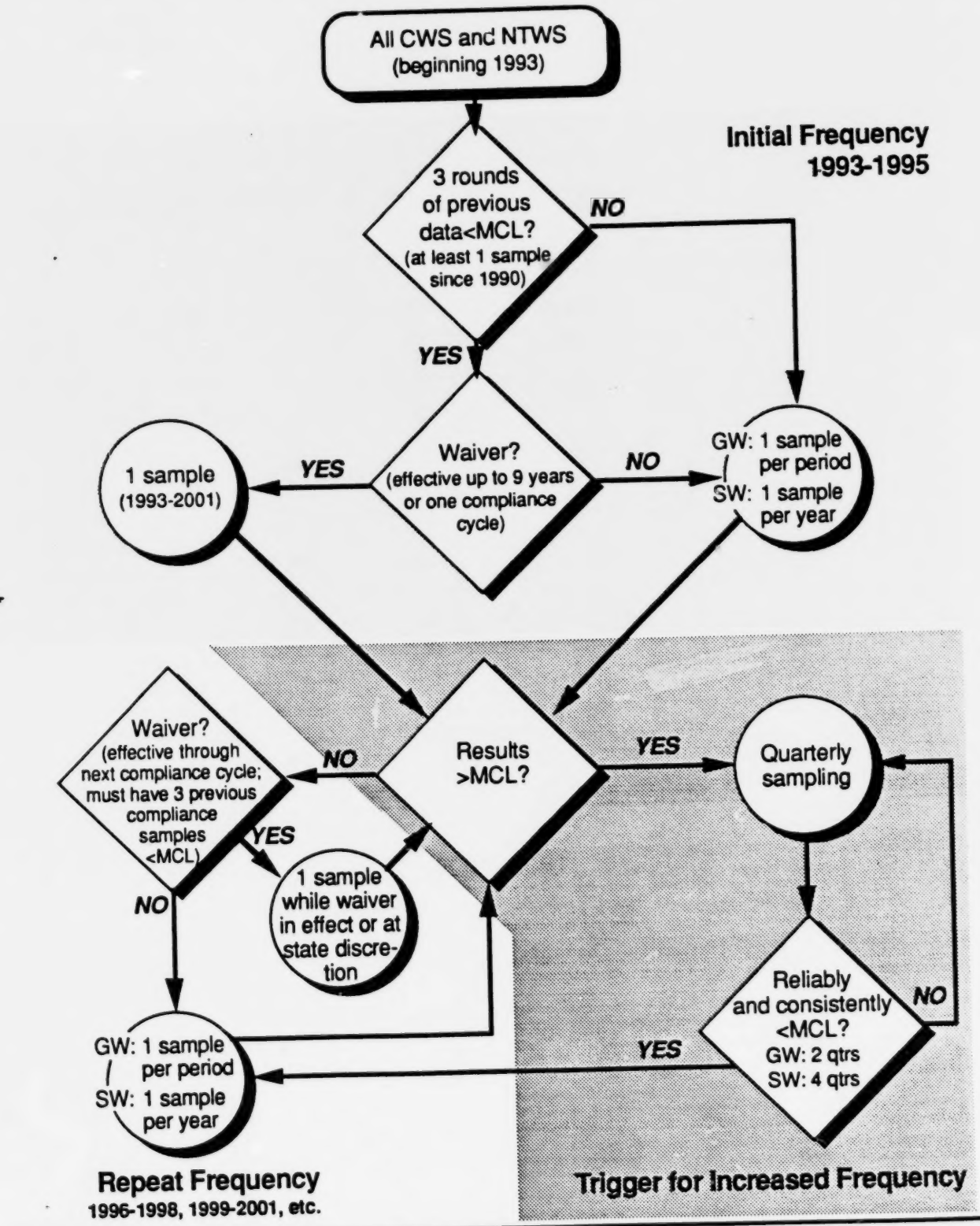
Standardized Monitoring Framework: Inorganics (CWS and NTWS)

	CALENDAR YEAR		BASE REQUIREMENTS		WAIVERS (ALL SYSTEMS)
			SW	GW	
	1991				State may waive the base sampling requirements provided 3 previous samples are less than the MCL
	1992				
First 9 - year Compliance Cycle	1993	Initial Monitoring Round	1 sample at each sampling point	1 sample at each sampling point	1 sample at each sampling point
	1994		1 sample at each sampling point		
	1995		1 sample at each sampling point		
	1996	Repeat Monitoring	1 sample at each sampling point	1 sample at each sampling point	
	1997		1 sample at each sampling point		
	1998		1 sample at each sampling point		
	1999	Repeat Monitoring	1 sample at each sampling point	1 sample at each sampling point	
	2000		1 sample at each sampling point		
	2001		1 sample at each sampling point		
Begins Second 9 - year Cycle	2002	Repeat Monitoring Round	1 sample at each sampling point	1 sample at each sampling point	State may waive the base sampling requirements provided 3 previous samples are less than the MCL
	2003		1 sample at each sampling point		
	2004		1 sample at each sampling point		

NOTES

- States will designate the year during each compliance period in which each system must sample.
- EPA is requiring states to schedule one-third of their systems for sampling in 1993, another one-third in 1994, and the final one-third in 1995.

Inorganic Monitoring Flow Chart



EPA Volatile Organic Chemical Monitoring

EPA Phase II Fact Sheet Series (6 of 14)

October 1991

This fact sheet summarizes the monitoring requirements for 10 volatile organic chemicals (VOCs) as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule in January 1991. These requirements also apply to the eight VOCs contained under EPA's Phase I Rule which was promulgated in July 1987. Monitoring for the 18 VOCs in accordance with the Standardized Monitoring Framework begins in January 1993.

Systems Affected

All community water systems (CWS) and nontransient, noncommunity water systems (NTWS) must comply with the monitoring requirements for volatile organic chemicals.

Sampling Points

Sampling must be conducted at each entry point to the distribution system. Sampling points must be representative of the well or source water after treatment.

Initial Base Sampling

Between 1993 and 1995, all systems must take four consecutive quarterly samples for each of the 10 new (Phase II) contaminants unless 1) a waiver has been granted by the state (see waiver requirements below) or 2) the system has previous sampling data enabling it to qualify for reduced sampling (see grandfathering section below). The state will designate the year in which each system samples within this compliance period

Grandfathering

States may allow sampling data collected after January 1, 1988 to satisfy the initial requirements. If the initial samples for the new organics are completed by December 31, 1992 and the system did not detect any of the organics, then the system need only take one sample annually beginning January 1, 1993.

Trigger for Increased/Decreased Sampling

The method detection limit (MDL) is the trigger for increased/decreased sampling for each of the volatile organics. [See sidebar for a list of contaminants and their corresponding maximum contaminant levels (MCLs) and MDL].

Regulated Contaminants

Eight Original VOCs	MCL (mg/L)
Benzene	0.005
Carbon tetrachloride	0.005
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
para-Dichlorobenzene	0.075
1,1,1-Trichloroethane	0.20
Trichloroethylene	0.005
Vinyl chloride	0.002

Ten New VOCs	MCL (mg/L)
cis-1,2-Dichloroethylene	0.07
1,2-Dichloropropane	0.005
Ethylbenzene	0.7
Monochlorobenzene	0.1
o-Dichlorobenzene	0.6
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
Trans-1,2-Dichloroethylene	0.1
Xylenes (total)	10

NOTE: The method detection limit (MDL) for all 18 volatile organics is 0.0005 mg/L.

Repeat Base Sampling (no detects)

Systems would continue taking four consecutive quarterly samples during subsequent three-year compliance periods. However, if contaminants are not detected during the initial round of sampling, states may allow systems to decrease their sampling frequency beginning in the 1996 compliance period as follows:

1) ***Groundwater systems*** must take at least one sample annually. After three years of annual sampling and no previous detection, ***groundwater systems*** can further reduce their sampling frequency to one sample per compliance period.
2) ***Surface water systems*** must sample annually.

Increased Sampling (if detected or MCL exceeded)

If contaminants are detected at or above the MDL or if the MCL is exceeded, then systems must sample quarterly beginning in the next quarter.

1) Systems remain on quarterly sampling until a baseline is established (minimum of two quarters for ***groundwater systems*** and four quarters for ***surface water systems***).
2) If the baseline indicates a system is "reliably and consistently" below the MCL, the state may reduce the system's sampling frequency to annual. (Annual sampling must be conducted during the quarter which previously yielded the highest analytical result.)
3) Systems which have three consecutive annual samples with no detection may apply to the state for a waiver (see waiver requirements below).
4) If any detection exceeds the MCL, both ***groundwater*** and ***surface water systems*** must take four consecutive quarterly samples until a reliable baseline is established.

Confirmation Samples

States may require a confirmation sample for positive or negative results. If taken, the compliance determination must be based on the average of the results of the initial and confirmation samples.

Compliance Determination

1) If a system samples more frequently than annually (quarterly or semi-annually), the system is in violation if the running annual average at any sampling point exceeds the MCL.
2) If a system samples on an annual or less frequent basis (i.e., one sample per compliance period), the system is in violation if one sample (or the average of the original and confirmation samples) at any point exceeds the MCL.

Public Notice

Any system violating any National Primary Drinking Water Regulation (MCL, monitoring and reporting requirements, etc.) for one or more of the VOCs must give public notice. For a MCL violation, systems must issue a public notice that includes the specific mandatory health effects language contained in the Phase II Rule. Systems must publish the notice in the newspaper within 14

days and deliver the notice to consumers within 45 days. For monitoring violations, systems must notify consumers through major newspapers within three months. Follow-up notices must be issued every three months for the duration of any violation. NTWS have additional options of hand delivering or continuously posting public notices instead of using the above delivery routes.

Compositing

Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

Systems can apply to the state for a waiver from initial and repeat base sampling frequencies. Systems are eligible for both ***"use"*** and ***"susceptibility"*** waivers provided a vulnerability assessment has been conducted. Systems are eligible for waivers beginning in the compliance period 1993 to 1995. Waivers are effective for two compliance periods, provided the waiver conditions are met. Waivers must be renewed in subsequent compliance periods or the system must conduct sampling that is commensurate with base requirements.

Use Waivers

A state may grant a "use" waiver after determining that volatile organics were not used previously in the water supply area (i.e., the contaminant was not used, manufactured, stored or disposed). Systems ineligible for a "use" waiver can apply for a waiver based on "susceptibility."

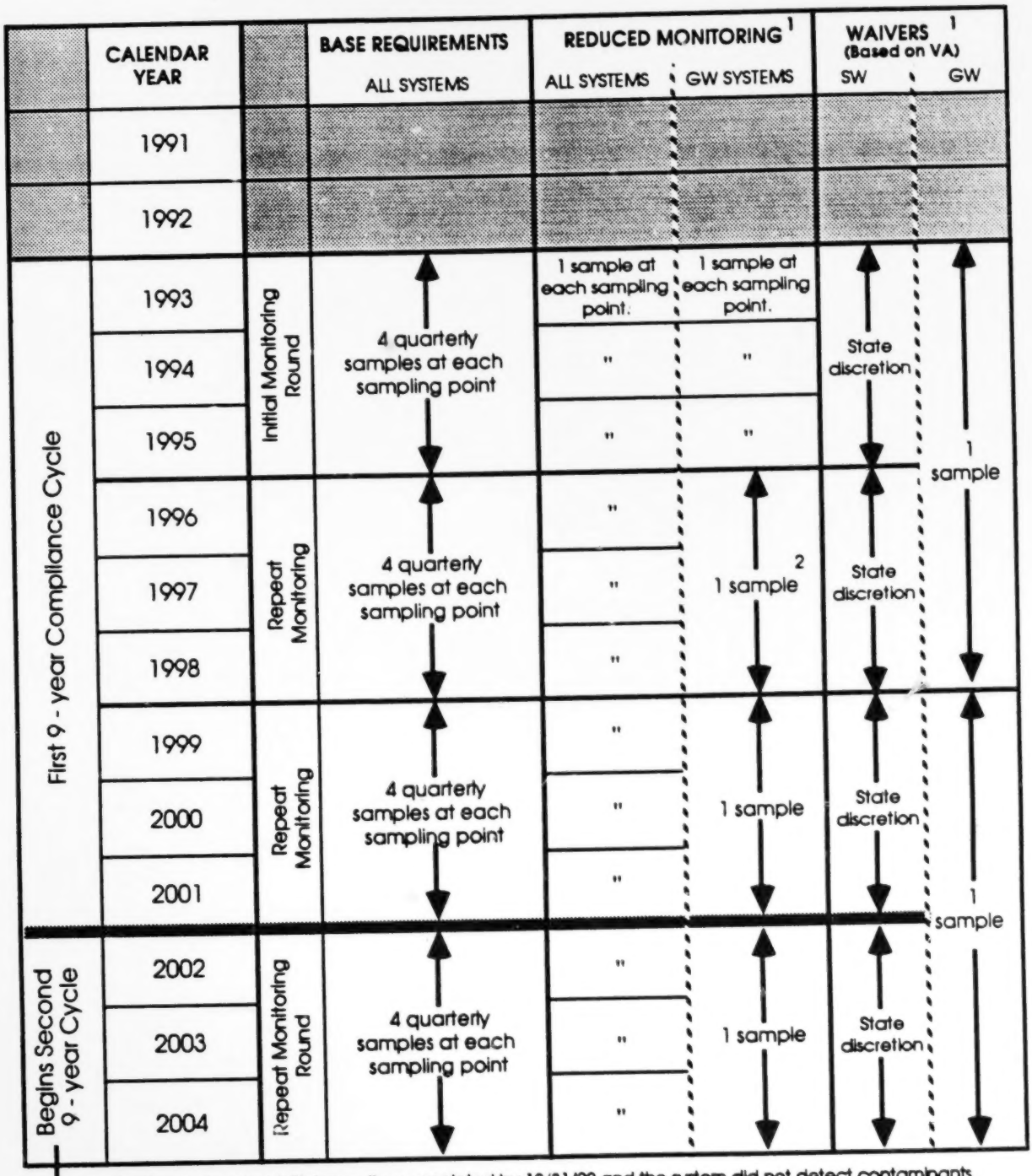
Susceptibility Waivers

"Susceptibility" waivers are contingent on the conduct of a thorough vulnerability assessment which considers prior analytical and/or vulnerability assessment results (including those of surrounding systems), environmental persistence and transport, how well the source is protected, Wellhead Protection Assessments, and proximity to sources of contamination. If a waiver is granted based on susceptibility, sampling requirements are eliminated for the compliance period in which the waiver was granted.

Sampling Frequency with Waivers

Groundwater systems that have been granted a six-year waiver are required to sample once during the waiver period and must update the vulnerability assessment at the midpoint or three year mark of the six-year period. ***Surface water systems*** with a three-year waiver are required to sample only at the discretion of the state.

Standardized Monitoring Framework: Volatile Organic Chemicals (CWS and NTWS)



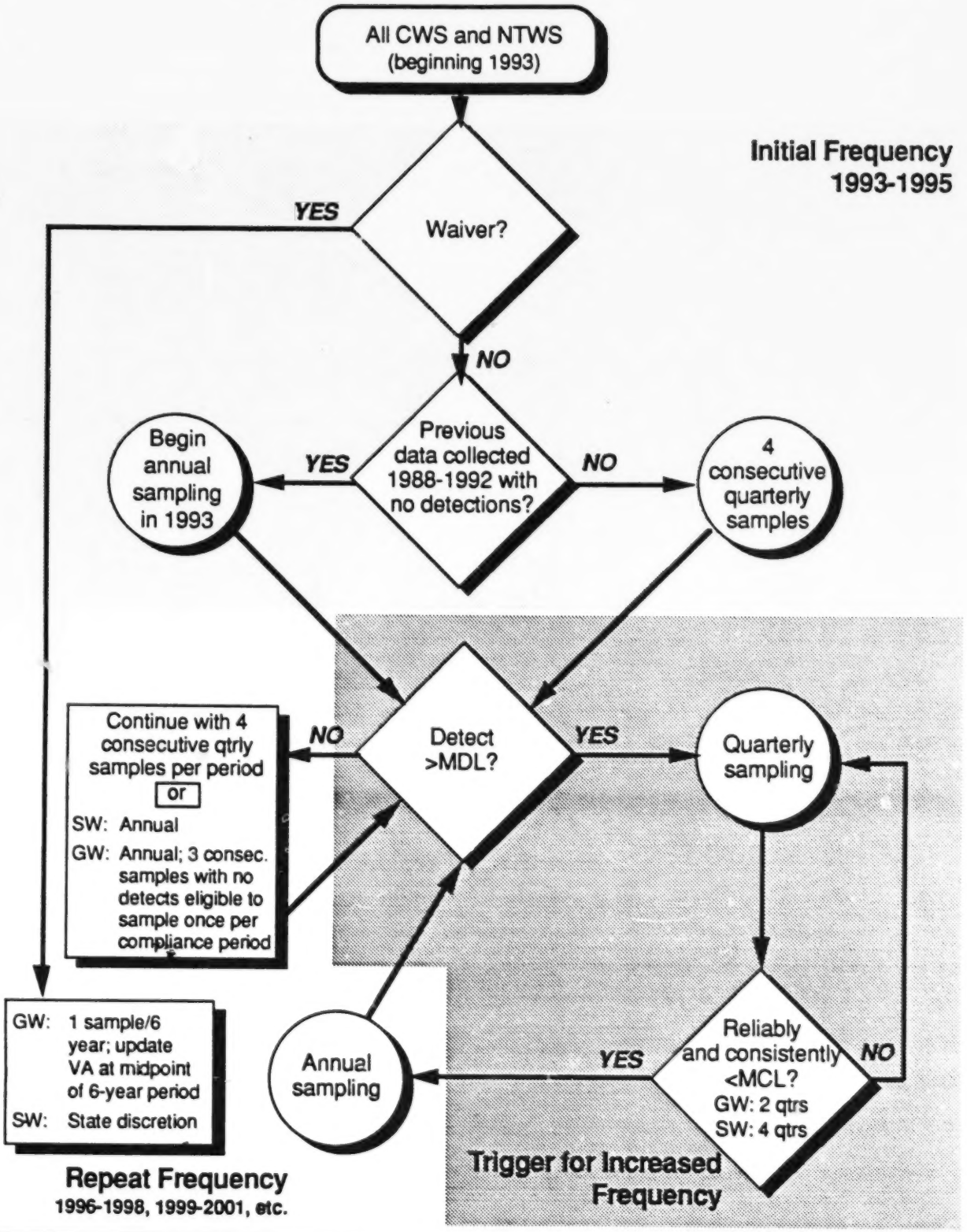
Footnotes 1 Provided initial sampling completed by 12/31/92 and the system did not detect contaminants.

2 Reduction allowed after no detection of contaminants in three years of annual sampling data.

NOTES

- States will designate the year during each compliance period in which each system must sample.
- EPA is requiring states to schedule one-third of their systems for sampling in 1993, another one-third in 1994, and the final one-third in 1995.

Volatile Organic Chemical Monitoring Flow Chart



EPA Pesticide Monitoring

EPA Phase II Fact Sheet Series (7 of 14)

October 1991

This fact sheet summarizes the monitoring requirements for 17 pesticides (12 new and five revised) and polychlorinated biphenyls (PCBs) as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. Monitoring for the pesticides and PCBs begins in January 1993.

Systems Affected

All community water systems (CWS) and nontransient, noncommunity water systems (NTWS) must comply with the monitoring requirements for pesticides and PCBs.

Sampling Points

Sampling must be conducted at each entry point to the distribution system. Sampling points must be representative of the well or source water after treatment.

Initial Base Sampling

Between 1993 and 1995, all systems must take an initial round of four consecutive quarterly samples unless a waiver has been granted by the state (see below for summary of waiver requirements). The state will designate the year in which each system samples within this compliance period.

Grandfathering

States may allow sampling data collected after January 1, 1990 to satisfy the initial base sampling requirements.

Trigger for Increased/Decreased Sampling

The method detection limit (MDL) is the trigger for increased/decreased sampling for each pesticide or PCB [see table on following page for a list of contaminants and their corresponding maximum contaminant levels (MCLs) and MDLs].

Repeat Base Sampling (no detects)

Systems would continue taking four consecutive quarterly samples during subsequent three-year compliance periods. However, if contaminants are not detected during the initial round of sampling, states may allow systems to decrease their sampling frequency beginning in the 1996 compliance period as follows:

1) Systems that serve greater than (>) 3300 persons may reduce their sampling frequencies to two quarterly samples in one year per compliance period.

2) Systems that serve less than or equal to (≤) 3300 persons may reduce their sampling frequencies to one sample in each compliance period.

Regulated Contaminants

Contaminant	MCL[1] (m/L)	MDL[2] (mg/L)
Alachlor	0.002	0.0002
Aldicarb	0.003*	0.0005
Aldicarb sulfoxide	0.004*	0.0005
Aldicarb sulfone	0.002*	0.0008
Atrazine	0.003	0.0001
Carbofuran	0.04	0.0009
Chlordane	0.002	0.0002
Dibromochloropropane (DPCP)	0.0002	0.00002
2,4-D	0.07	0.0001
Ethylene dibromide (EDB)	0.00005	0.00001
Heptachlor	0.0004	0.00004
Heptachlor epoxide	0.0002	0.00002
Lindane	0.0002	0.00002
Methoxychlor	0.04	0.0001
Polychlorinated biphenyls (PCBs)	0.0005	0.0001
Pentachlorophenol	0.001*	0.00004
Toxaphene	0.003	0.001
2,4,5-TP (Silvex)	0.05	0.0002

[1]MCL=Maximum Contaminant Level

[2]MDL=Method Detection Limit

*MCLs for aldicarb, aldicarb sulfoxide, aldicarb sulfone and pentachlorophenol were promulgated July 1, 1991 and will take effect January 1, 1993. The MCLs for the other contaminants were revised or promulgated January 30, 1991 and will take effect July 30, 1992.

Increased Sampling (if detected or MCL exceeded)

If contaminants are detected or if the MCL is exceeded in any sample, then systems must sample quarterly beginning in the next quarter. Systems are to sample quarterly until a baseline is established (minimum of two quarters for ***groundwater systems*** and four quarters for ***surface water systems***).

1) If the baseline indicates a system is "reliably and consistently" below the MCL, the state may reduce the system's sampling frequency to annual. (Annual sampling must be conducted during the quarter which previously yielded the highest analytical result.)
2) Systems which have three consecutive annual samples with no detection can apply to the state for a waiver.

Confirmation Samples

States may require a confirmation sample for positive or negative results. If a confirmation sample is used, the compliance determination is based on the average of the results of the initial and confirmation samples.

Compliance Determination

1) If a system samples more frequently than annual (i.e., quarterly or semi-annually), the system is in violation if the running annual average at any sampling point exceeds the MCL.

2) If a system conducts sampling on an annual or less frequent basis (i.e., one sample per compliance period), the system is in violation if one sample (or the average of the initial and confirmation samples) at any point exceeds the MCL.

Public Notice

Any system violating a National Primary Drinking Water Regulation (i.e., MCL, monitoring and reporting requirements, etc.) for one or more of the 17 pesticides and PCBs must give public notice. For a MCL violation, systems must issue a public notice that includes the specific mandatory health effects language contained in the Phase II Rule. Systems must publish the notice in the newspaper within 14 days and deliver the notice to consumers within 45 days. For monitoring violations, systems must notify consumers through major newspapers within three months. Follow-up notices must be issued every three months for the duration of any violation. NTWS have additional options of hand delivering or continuously posting public notices instead of using the above delivery routes.

Compositing

Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

Systems can apply to the state for a waiver from initial and repeat base sampling frequencies. Systems are eligible for both ***"use"*** and ***"susceptibility"*** waivers provided the system has conducted a vulnerability assessment. Systems are eligible for waivers beginning in the initial compliance period, 1993 to 1995. Waivers are effective for one compliance period; they must be renewed in subsequent compliance periods or the system must conduct sampling that is commensurate with base requirements. Systems receiving a waiver are not required to sample.

Use Waivers

When a system, on the basis of a vulnerability assessment, demonstrates that the regulated pesticide/PCB has not been used in the water supply area (i.e., the contaminant was not used, manufactured, stored or disposed of in the area), the system can apply to the state for a "use" waiver. Systems not eligible for "use" waivers may still qualify for a waiver by evaluating susceptibility (see below).

Susceptibility Waivers

"Susceptibility" waivers are contingent on the conduct of a thorough vulnerability assessment. Such a vulnerability assessment must consider prior analytical and/or vulnerability assessment results (including those of surrounding systems), environmental persistence and transport, how well the source is protected, Wellhead Protection Assessments, and proximity of the supply to sources of contamination.

Standardized Monitoring Framework: Pesticides (CWS and NTWS)

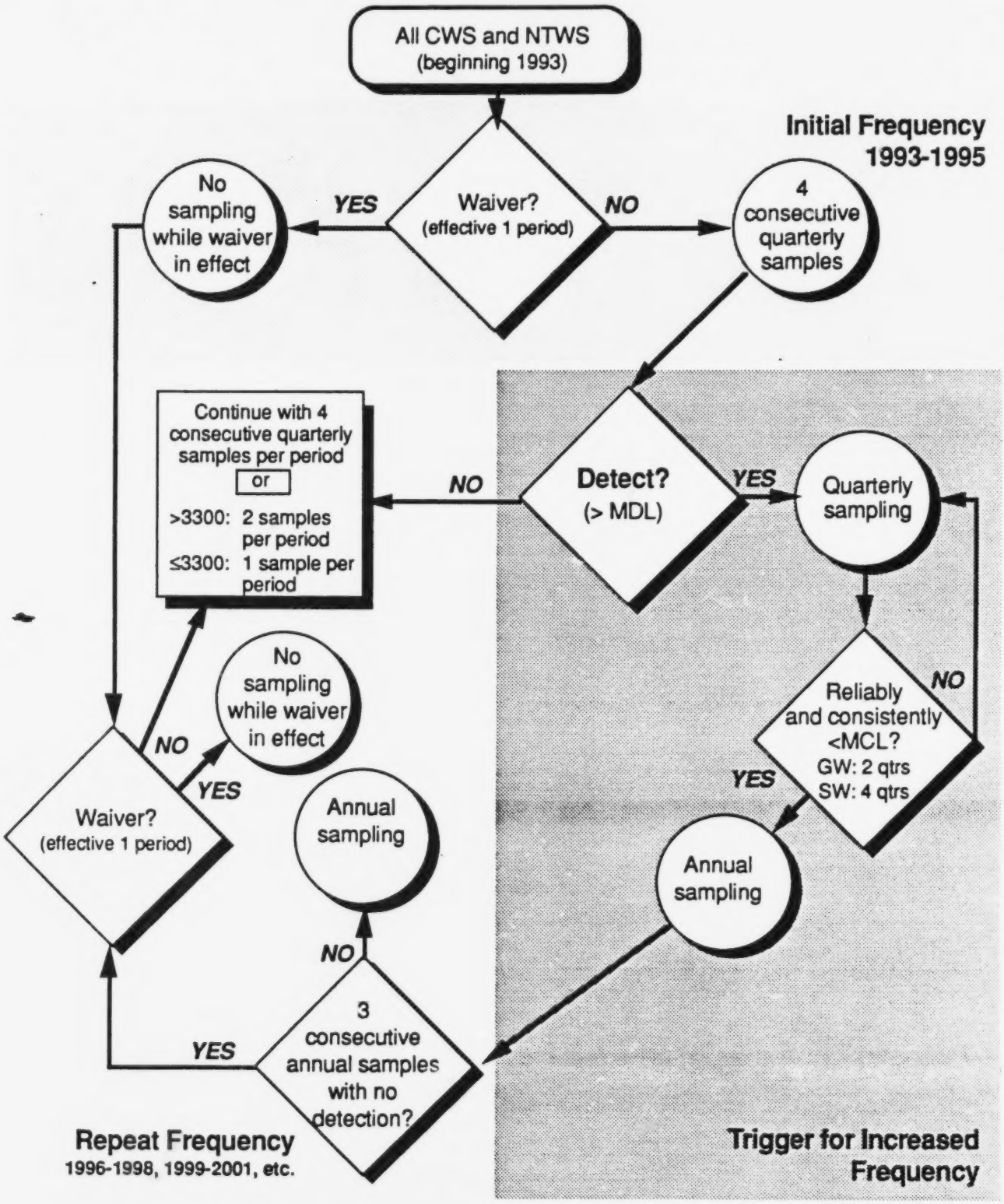
	CALENDAR YEAR		BASE REQUIREMENTS: ALL SYSTEMS	REDUCED MONITORING: SYSTEMS WITH NO PREVIOUS DETECTION	WAIVERS *
	1991				
	1992				
First 9 - year Compliance Cycle	1993	Initial Monitoring Round	4 quarterly samples at each sampling point	Not Applicable	Waiver
	1994				
	1995				
	1996	Repeat Monitoring	4 quarterly samples at each sampling point	Systems Serving: > 3,300 - 2 samples at each sampling point ≤ 3,300 - 1 sample at each sampling point	Waiver
	1997				
	1998				
	1999	Repeat Monitoring	4 quarterly samples at each sampling point	Systems Serving: > 3,300 - 2 samples at each sampling point ≤ 3,300 - 1 sample at each sampling point	Waiver
	2000				
	2001				
Begins Second 9 - year Cycle	2002	Repeat Monitoring Round	4 quarterly samples at each sampling point	Systems Serving: > 3,300 - 2 samples at each sampling point ≤ 3,300 - 1 sample at each sampling point	Waiver
	2003				
	2004				

NOTES

- States will designate the year during each compliance period in which each system must sample.
- EPA is requiring states to schedule one-third of their systems for sampling in 1993, another one-third in 1994, and the final one-third in 1995.

* Based on "use" and/or "susceptibility" assessment (No Samples Required)

Pesticide Monitoring Flow Chart



EPA Unregulated Contaminant Monitoring

EPA Phase II Fact Sheet Series (8 of 14)

October 1991

This fact sheet summarizes the one-time monitoring requirements for 24 organic and six inorganic chemicals as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. Monitoring for these contaminants begins in January 1993.

Unregulated Contaminants

Organics (Pesticides)

Aldrin
Benzo(a)pyrene
Butachlor
Carbaryl
Dalapon
Di(2-ethylhexyl)adipate
Di(2ethylhexyl)phthalates
Dicamba
Dieldrin
Dinoseb
Diquat
Endothall
Glyphosate
Hexachlorobenzene
Hexachlorocyclopentadiene
3-Hydroxycarbofuran
Methomyl
Metolachlor
Metribuzin
Oxamyl (vydate)
Picloram
Propachlor
Simazine
2,3,7,8-TCDD (Dioxin)

Inorganics

Antimony
Beryllium
Nickel
Sulfate
Thallium
Cyanide

Systems Affected

All community water systems (CWS) and nontransient, noncommunity water systems (NTWS) must conduct monitoring for the 24 organic and six inorganic chemicals (see sidebar for lists of contaminants).

Sampling Points

Sampling must be conducted at each entry point to the distribution system. Sampling points must be representative of the well or source water after treatment.

Sampling Requirements

All systems must conduct a one-time round of sampling, unless a waiver has been granted by the state (see below for summary of waiver requirements). The specific sampling requirements are:

1) For the 24 organic chemicals, systems must take four consecutive quarterly samples and report the results to the state.
2) For the six inorganic chemicals, systems must take one sample and report the results to the state.
3) Sampling must be completed no later than December 31, 1995.

Confirmation Samples

The state may require a confirmation sample for positive or negative results.

Compositing

Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems serving greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Waivers

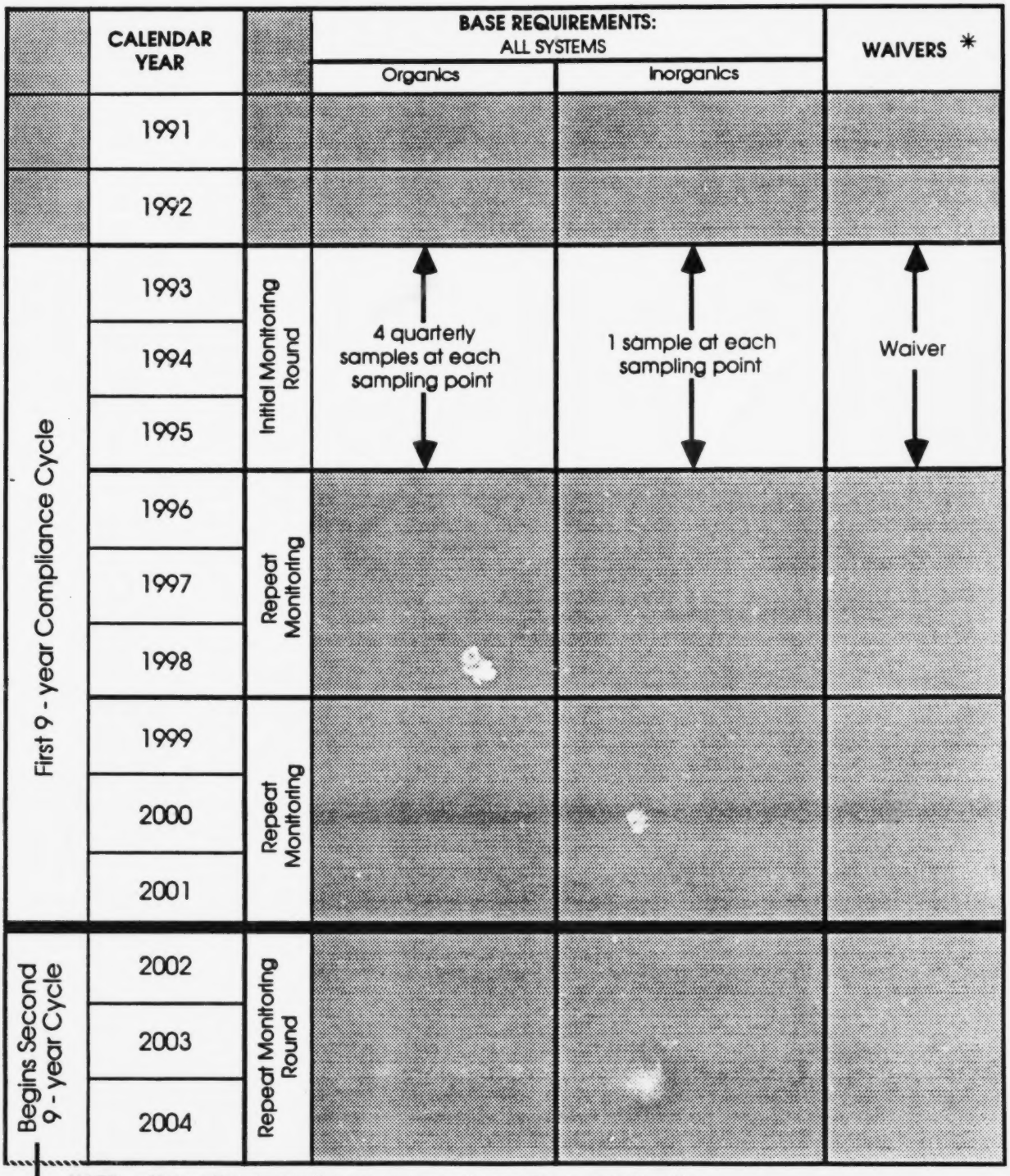
Systems may apply to the state for a waiver from the sampling requirements. Such waivers may be granted for either the organics or inorganics, or both, as described below. Sampling is not required for systems that have received a waiver.

1) **Waiver for Organics:** When a system can rule out previous use of the chemical in the water supply area (i.e., the contaminant was not used, manufactured, stored or disposed of in the area), the system can apply to the state for a "use" waiver. If previous use is unknown, then systems may still qualify for a waiver by evaluating susceptibility. "Susceptibility" waivers are contingent on the conduct of a thorough vulnerability assessment. The state may grant a "susceptibility" waiver based on an evaluation of prior analytical and/or vulnerability assessment results (including those of surrounding systems), environmental persistence and transport, how well the source is protected, Wellhead Protection Assessments, and proximity to sources of contamination.

2) **Waiver for Inorganics:** The state may grant a waiver if previous analytical results indicate contamination would not occur, provided this data was collected after January 1, 1990.

3) **Waiver for Very Small Systems:** Systems serving fewer than 150 service connections may obtain a waiver by sending a letter to the state indicating that the system is available for sampling. This letter must be sent to the state by January 1, 1994.

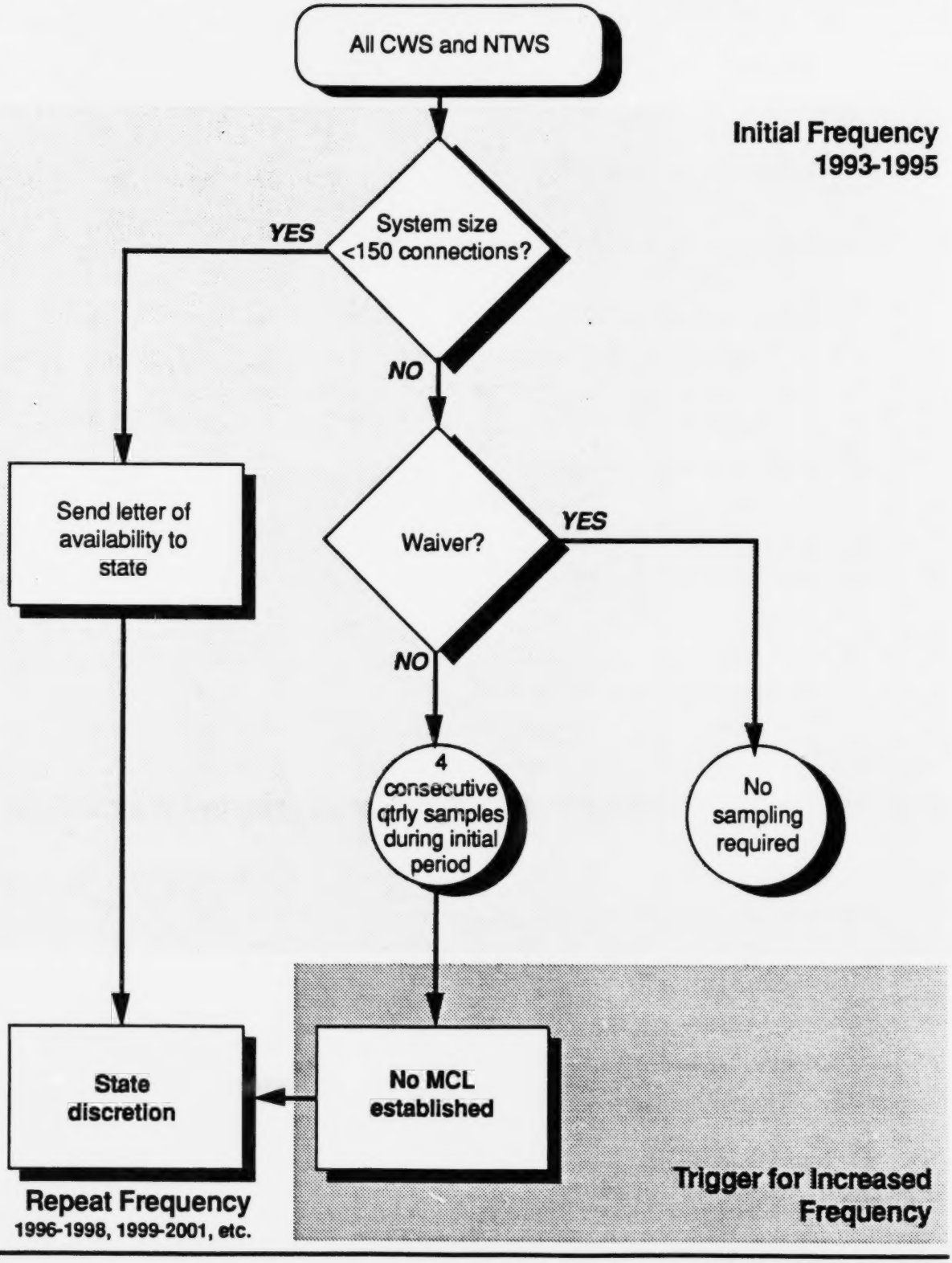
Standardized Monitoring Framework: Unregulated Contaminants (CWS and NTWS)



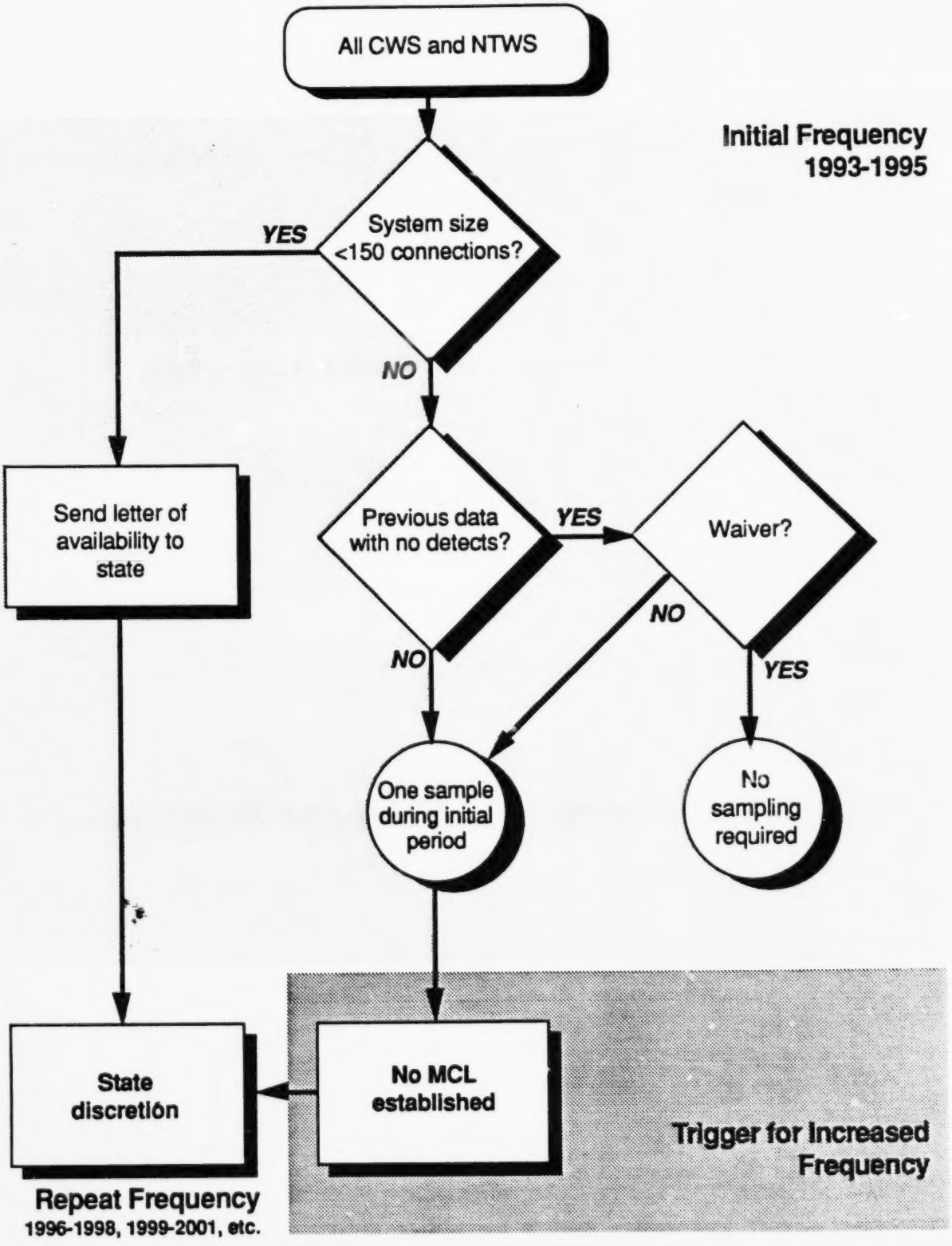
NOTES
- States will designate the year during each compliance period in which each system must sample.
- EPA is requiring states to schedule one-third of their systems for sampling in 1993, another one-third in 1994, and the final one-third in 1995.

* Based on "use" and/or "susceptibility" assessment (No Samples Required)

Unregulated Contaminant Monitoring Flow Chart — Organics (Pesticides)



Unregulated Contaminant Monitoring Flow Chart — Inorganics



EPA Analytical Methods

EPA Phase II Fact Sheet Series (9 of 14)

October 1991

This fact sheet summarizes the analytical requirements for 38 synthetic organic and inorganic chemicals as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. The fact sheet also contains recent corrections in methods for sample preservation and analysis.

Laboratory Certification

Analyses of monitoring samples for compliance purposes may only be conducted by laboratories which have been certified by the state or EPA.

To receive approval for inorganic chemical (IOC) analyses, a laboratory must:

- Analyze a set of IOC performance evaluation (PE) samples supplied by EPA or the state using the methods listed in Table 1;
- Achieve acceptance limits (ALs) established for each inorganic contaminant as listed in Table 1; and
- Pass an on-site inspection.

To receive certification for volatile organic chemical (VOC) analyses, a laboratory must:

- Analyze a set of VOC PE samples supplied by EPA or the state using the methods listed in Table 2;
- Achieve a ±20 percent AL on 80 percent of all Phase I and Phase II VOCs, except vinyl chloride, when the actual amount is ≥0.010 mg/L;
- Achieve a ±40 percent AL on 80 percent of all Phase I and Phase II VOCs, except vinyl chloride, when the actual amount is <0.010 mg/L;
- Achieve a method detection limit (MDL) of 0.0005 mg/L; and
- Pass an on-site inspection.

To receive certification for synthetic organic chemicals (SOC) analyses [i.e., pesticides and polychlorinated biphenyls (PCBs)], a laboratory must:

- Analyze a set of SOC performance samples supplied by EPA or the state using the methods listed in Table 3;
- Achieve ALs as listed in Table 3 for each substance;
- Achieve MDLs for each substance as listed in Table 3; and
- Pass an on-site inspection.

State Laboratory Program Requirements

As part of their primary enforcement responsibilities, states must:

- assure the availability of sufficient qualified lab facilities to meet the state's analytical needs;

- establish and maintain a certification program for laboratories, except where all analyses are conducted by state laboratories; and
- designate official(s) to be responsible for this program.

Cost-Effective Analytical Strategies

To minimize analytical costs, labs may select an approved analytical method which measures the greatest number of contaminants for which a system is vulnerable. For example, EPA Method 505 can be used to measure alachlor, atrazine, chlordane, heptachlor, heptachlor epoxide, lindane, methoxychlor, and toxaphene. Method 505 can also be used as a screen for PCBs.

(Note: Additional information on VOC analysis is available in *How to Convert From THM to VOC Purge and Trap Gas Chromatographic Analysis.* EPA 570/9-88-011. Available from the Safe Drinking Water Hotline, 1-800-426-4791.)

Compositing

Composite samples are allowed at state discretion from no more than five sampling points. Compositing of samples must be completed in a certified drinking water laboratory.

1) For systems greater than (>) 3300 persons, compositing is only allowed at sampling points within a single system.
2) For systems serving less than or equal to (≤) 3300 persons, compositing among different systems is permitted.

Sample Preservation

Preservation and other parameters for inorganic and organic samples are summarized in the following two tables. For the exact preservation procedure for a contaminant, consult the methods given in Tables 3, 4, and 5.

Table 1. Inorganic Sample Preservation

Contaminant	Preservative	Time
Asbestos	Cool, 4° C	
Barium	Conc. HNO_3 to pH<2	6 Months
Cadmium	Conc. HNO_3 to pH<2	6 Months
Chromium	Conc. HNO_3 to pH<2	6 Months
Fluoride	None	1 Month
Mercury	Conc. HNO_3 to pH<2	28 Days
Nitrate:		
Chlorinated	Cool, 4° C	28 Days
Non-chlorinated	Conc. H_2SO_4 to pH<2	14 Days
Nitrite	Cool, 4° C	48 Hours
Selenium	Conc. HNO_3 to pH<2	6 Months

Containers may be plastic or glass.

Table 2. Organic Sample Preservation

Chemical	Method	Preservative	Container Size (all are glass)	Sample Hold Time and Temperature
VOCs	All VOC Methods	Dechlorinate*, acidify with HCL	40 to 120 mL vials	14 d., 4°C
Alachlor	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	507	Sodium Thiosulfate and $HgCl_2$	1 L bottle	14 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Aldicarb	531.1	Sodium Thiosulfate and pH 3	60 mL vial	28 d., -10°C
Aldicarb sulfone	531.1	Sodium Thiosulfate and pH 3	60 mL vial	28 d., -10°C
Aldicarb sulfoxide	531.1	Sodium Thiosulfate and pH 3	60 mL vial	28 d., -10°C
Atrazine	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	507	Sodium Thiosulfate and $HgCl_2$	1 L bottle	14 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Carbofuran	531.1	Sodium Thiosulfate and pH 3	60 mL vial	28 d., -10°C
Chlordane	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Dibromochloro–propane	504	Sodium Thiosulfate and HCl	40 mL bottles	28 d., 4°C
Ethylene dibromide	504	Sodium Thiosulfate and HCl	40 mL bottles	28 d., 4°C
Heptachlor	505	Sodium Thiosulfate	40 mL bottle	7 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Heptachlor epoxide	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Lindane	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Methoxychlor	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
Pentachloro-phenol	515.1	Sodium Thiosulfate and $HgCl_2$	1 L bottle	14 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
PCB (screen)	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
PCB (aroclors)	508A	No Chemicals	1 L bottle	14 d., 4°C
Toxaphene	505	Sodium Thiosulfate	40 mL bottle	14 d., 4°C
	508	Sodium Thiosulfate and $HgCl_2$	1 L bottle	7 d., 4°C
	525.1	Sodium Thiosulfate and HCl	1 L or 1 qt. bottle	7 d., 4°C
2,4-D	515.1	Sodium Thiosulfate and $HgCl_2$	1 L bottle	14 d., 4°C
2,4,5-TP (Silvex)	515.1	Sodium Thiosulfate and $HgCl_2$	1 L bottle	14 d., 4°C

* Dechlorinate if the sample contains a chlorine residual. Ascorbic acid may NOT be suitable for all finished waters.

Table 3. Inorganic Analytical Methods

Analyte	Method*	Type†	MCL (mg/L)	Acceptance Limit (±%)	Method Detection Limit (mg/L)
Asbestos	TEM[1]	TEM	7 MFL	2σ**	0.01 MFL
Barium	200.7	ICP	2	15	0.002
	208.1	DAAA			0.1
	208.2	GFAA			0.002
	SM-304[5]	GFAA			0.002
	SM-303C[5]	DAAA			0.03
Cadmium	200.7	ICP	0.005	20	0.001
	213.1	DAAA			0.005
	213.2	GFAA			0.0001
	SM-304[2,5]	GFAA			0.0001
Chromium	200.7	ICP	0.1	15	0.007
	218.1	DAAA			0.05
	218.2	GFAA			0.001
	SM-304[5]	GFAA			0.002
Mercury	245.1	MCV	0.002	30	0.0002
	245.2	ACV			0.0002
Nitrate	300.0	IC	10 (as N)	10	0.01
	353.1	AHR			0.01
	353.2	ACR			0.05
	353.3	MCR			0.01
	WeWWG-5880[6]	ISE			1
	B-1011[4]	IC			0.0003
Nitrite	300.0	IC	1 (as N)	15	0.004
	353.2	ACR			0.05
	353.3	MCR			0.01
	354.1	SPEC			0.01
	B-1011[4]	IC			0.003
Selenium	270.2	GFAA	0.05	20	0.002
	SM-304[3,5]	GFAA			0.002

* NOTE: All methods are EPA methods unless otherwise indicated and may be found in: *Methods of Chemical Analysis of Water and Wastes,* EPA Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268, (EPA 600/4-79-020), March 1983. For recent revisions to this manual, see *Methods for the Determination of Metals in Environmental Samples,* EPA Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268, (EPA 600/4-91-010), June 1991. Available from EPA's Center for Environmental Research Information, telephone: (513) 569-7355.

** σ–"Standard Deviations"

1 *Analytical Method for Determination of Asbestos Fibers in Water,* EPA Environmental Research Laboratory, Athens, GA, 30613, EPA 600/4-83-043, September 1983. Also available from National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161 (Publication No. PB83-260-471. Price $31).

2 The addition of 1 mL of 30% H_2O_2 for each 100 mL of standards and samples is required before analysis.

3 Prior to dilution of the Se calibration standard, add 2 mL of 30% H_2O_2 for each 100 mL of standard.

4 *Waters Test Method for the Determination of Nitrate/Nitrite in Water Using Single Column Ion Chromatography,* Method B-1011, Millipore Corp., Waters Chromatography Division, 34 Maple Street, Milford, MA 01757.

5 *Standard Methods for the Examination of Water and Wastewater,* 16th Edition, 1985.

6 *Orion Guide to Water and Wastewater Analysis,* Orion Research Inc., Cambridge, MA, 1985.

† **Method Type Key**

ACR	Automated Cadmium Reduction	GFAA	Atomic Absorption; Graphite Furnace	MCR	Manual Cadmium Reduction
ACV	Automated Cold Vapor	IC	Ion Chromatography	MCV	Manual Cold Vapor
AHR	Automated Hydrazine Reduction	ICP	Inductively-Coupled Plasma	SPEC	Spectrophotometric
DAAA	Atomic Absorption; Direct Aspiration	ISE	Ion Selective Electrode	TEM	Transmission Electron Microscopy

Table 4. Volatile Organic Analytical Methods

Analyte	Approved EPA Methods Column Type		MCL (mg/L)	Acceptance Limit (±%)	Method Detection Limit (mg/L)
	Packed	Capillary			
Benzene	503.1, 524.1	502.2, 524.2	0.005	All VOCs:	All VOCs:
Carbon tetrachloride	502.1, 524.1	502.2, 524.2	0.005	± 20% at ≥	
p-Dichlorobenzene	502.1, 503.1, 524.1	502.2, 524.2	0.075	0.010 mg/L	0.0005
o-Dichlorobenzene	502.1, 503.1, 524.1	502.2, 524.2	0.6		
1,2-Dichloroethane	502.1, 524.1	502.2, 524.2	0.005	± 40% at <	
1,1-Dichloroethylene	502.1, 524.1	502.2, 524.2	0.007	0.010 mg/L	
cis-1,2-Dichloroethylene	502.1, 524.1	502.2, 524.2	0.07		
trans-1,2-Dichloroethylene	502.1, 524.1	502.2, 524.2	0.1		
1,2-Dichloropropane	502.1, 524.1	502.2, 524.2	0.005		
Ethylbenzene	503.1, 524.1	502.2, 524.2	0.7		
Monochlorobenzene	502.1, 503.1, 524.1	502.2, 524.2	0.1		
Styrene	503.1, 524.1	502.2, 524.2	0.1		
Tetrachloroethylene	502.1, 503.1, 524.1	502.2, 524.2	0.005		
1,1,1-Trichloroethane	502.1, 524.1	502.2, 524.2	0.2		
Trichloroethylene	502.1, 503.1, 524.1	502.2, 524.2	0.005		
Toluene	503.1, 524.1	502.2, 524.2	1		
Vinyl Chloride	502.1, 524.1	502.2, 524.2	0.002		
Xylenes (total)	503.1, 524.1	502.2, 524.2	10		

Table 5. Synthetic Organic Analytical Methods

Analyte	EPA Method	MCL (mg/L)	Acceptance Limit (±%)	Method Detection Limit (mg/L)
Alachlor	505, 507, 525.1	0.002	45	0.0002
Aldicarb	531.1	0.003	2σ*	0.0005
Aldicarb sulfone	531.1	0.002	2σ*	0.0008
Aldicarb sulfoxide	531.1	0.004	2σ*	0.0005
Atrazine	505, 507, 525.1	0.003	45	0.0001
Carbofuran	531.1	0.04	45	0.0009
Chlordane	505, 508, 525.1	0.002	45	0.0002
Dibromochloropropane	504	0.0002	40	0.00002
Ethylene dibromide	504	0.00005	40	0.00001
Heptachlor	505, 508, 525.1	0.0004	45	0.00004
Heptachlor epoxide	505, 508, 525.1	0.0002	45	0.00002
Lindane	505, 508, 525.1	0.0002	45	0.00002
Methoxychlor	505, 508, 525.1	0.04	45	0.0001
Pentachlorophenol	515.1, 525.1	0.001	50	0.00004
PCBs (screening, Aroclors):	505, 508	—	100	—
1016				0.00008
1221				0.02
1232				0.0005
1242				0.0003
1248				0.0001
1254				0.0001
1260				0.0002
PCBs (decachlorobiphenyl)	508A	0.0005	0-200%	0.0001
Toxaphene	505, 508, 525.1	0.003	45	0.001
2,4-D	515.1	0.07	50	0.0001
2,4,5-TP (Silvex)	515.1	0.05	50	0.0002

* σ –"Standard Deviations"

EPA

State Primacy Requirements

EPA Phase II Fact Sheet Series (10 of 14)

October 1991

This fact sheet summarizes the state primacy requirements as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. These requirements will take effect on July 30, 1992.

Implementation Schedule

April 30, 1992	→	Final state primacy applications submitted to EPA.
July 30, 1992	→	Federal rules become effective and state rules to be adopted.

Regulatory Requirements

The Phase II Rule requires that states adopt regulations by July 30, 1992 which are at least as stringent as the following sections:

141.23–Inorganic Monitoring	141.40–Unregulated Monitoring
141.24–Organic Monitoring	141.61–Organic Maximum Contaminant Levels
141.32–Public Notification	141.62–Inorganic Maximum Contaminant Levels

In addition, Phase II requires that the following conditions be met before a state's primacy application is approved by EPA:

Recordkeeping Requirements (§142.14)

For each public water system, the state must maintain the following records for 12 years:

- Analytical results of monitoring for all Phase II contaminants.
- The most recent vulnerability determination.
- All current monitoring requirements and the most recent monitoring frequency decision for each contaminant.
- The most recent asbestos repeat monitoring decision.
- Annual certifications received from systems demonstrating compliance with the treatment techniques for acrylamide and epichlorohydrin.

Reporting Requirements (§142.15)

For each public water system, the state must make quarterly reports of analytical results of monitoring for unregulated contaminants.

Special Primacy Requirements (§142.16)

1. A plan for the initial monitoring period which schedules systems for monitoring according to the availability of certified laboratories in each of the three years. This plan must be enforceable under state law.
2. **IF** a state chooses to issue monitoring waivers for regulated and unregulated contaminants (see Optional Provisions below), the state must describe:
   a. Procedures for making waiver decisions, specifically:
      - Waiver application requirements.
      - Process for determining "use" and "susceptibility" waivers.
      - Factors to be considered in granting or denying waivers.
   b. Monitoring data and other documentation to be used in making vulnerability determinations.

Optional Provisions

To increase their flexibility in implementing Phase II, states may adopt the following provisions at their discretion:

Waivers — The state decides whether to grant waivers from the monitoring requirements of Phase II.

Vulnerability Assessments — If the state allows monitoring waivers, the state has discretion to establish its own criteria for approval of vulnerability assessments performed by a water system.

EPA Public Notification

EPA Phase II Fact Sheet Series (11 of 14)

October 1991

This fact sheet summarizes the public notification requirements for violations of the National Primary Drinking Water Regulations (NPDWRs) promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. The NPDWRs will take effect on July 30, 1992, except for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol which will take effect on January 1, 1993. Monitoring for all 38 Phase II contaminants will begin in January 1993.

Systems Affected

All community water systems (CWS), transient and nontransient noncommunity water systems (TWS and NTWS, respectively) are legally responsible for notifying the public of violations of the Phase II NPDWRs. The methods for providing public notice vary depending on the type of system and/or the type of violation.

Violations that Trigger Public Notification

Tier 1

- Failure to comply with an applicable MCL.
- Failure to comply with a prescribed treatment technique.
- Failure to comply with the requirements of any schedule set under a variance or exemption.

  Note: Tier 1 violations may be either acute or non-acute. An *acute violation* involves the presence of a regulated substance in drinking water that causes harmful effects to human health after a brief exposure or single dosage (i.e., nitrate/nitrite). A *non-acute violation* involves the presence of a regulated substance in drinking water that causes harmful effects to human health after chronic (long-term) exposure or repeated dosage (i.e., all other Phase II contaminants).

Tier 2

- Failure to perform water quality monitoring as required by a NPDWR.
- Failure to comply with testing procedures as prescribed by a NPDWR.
- Operating under a variance or an exemption. (Note: Operating under a variance or an exemption is not a violation in itself. The condition is referred to as a violation for simplicity since public notification of such a condition is required.)

Content of Notice/Methods and Timing for Delivery

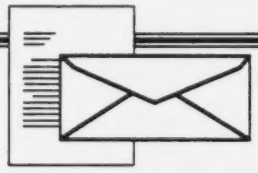
EPA requires that public notices include a discussion of a variety of issues such as an explanation of the violation, potential adverse health effects and the population at risk, steps to correct the problem, and recommended precautions. For a review of the content requirements for public notices, consult EPA's publication, *General Public Notification for Public Water Systems,*

(EPA 570/9-89-002, September 1989). This publication is available through EPA's Safe Drinking Water Hotline, 1-800- 426-4791.

The specific format, order, and emphasis of notice information varies depending on the circumstances of the violation for which a notice is being issued. The circumstances of a violation may vary depending on the *following* factors:

1) Tier 1 Acute Violation
2) Tier 1 Non-Acute Violation
3) Tier 2 Violation
4) Type of Public Water System: Community, Transient or Nontransient Noncommunity
5) Methods Available for Notification: Availability of Local Newspaper

Public notices for Tier 1 acute and non-acute violations and Tier 2 notices for variances or exemptions must include mandatory health effects language. Mandatory language for the Phase II contaminants is included in the final rule and may not be modified. Public water systems can, however, include additional information, particularly if the violation has been corrected by the time the notice is issued. Below is an example of mandatory health effects language (for nitrate).



Mandatory Health Effects Language for Nitrate

The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that nitrate poses an acute health concern at certain levels of exposure. Nitrate is used in fertilizer and is found in sewage and wastes from human and/or farm animals and generally gets into drinking water from those activities. Excessive levels of nitrate in drinking water have caused serious illness and sometimes death in infants under six months of age. The serious illness in infants is caused because nitrate is converted to nitrite in the body. Nitrite interferes with the oxygen carrying capacity of the child's blood. This is an acute disease in that symptoms can develop rapidly in infants. In most cases, health deteriorates over a period of days. Symptoms include shortness of breath and blueness of the skin. Clearly, expert medical advice should be sought immediately if these symptoms occur. The purpose of this notice is to encourage parents and other responsible parties to provide infants with an alternate source of drinking water. Local and State health authorities are the best source for information concerning alternate sources of drinking water for infants. EPA has set the drinking water standard at 10 parts per million (ppm) for nitrate to protect against the risk of these adverse effects. EPA has also set a drinking water standard for nitrite at 1 ppm. To allow for the fact that the toxicity of nitrate and nitrite are additive, EPA has also established a standard for the sum of nitrate and nitrite at 10 ppm. Drinking water that meets the EPA standard is associated with little to none of this risk and is considered safe with respect to nitrate. ■

Methods of Notification

- Through the local electronic media (radio and TV)
- In the local daily newspaper
- By direct mail
- In customer water bills
- Via hand delivery
- By continuous posting in a conspicuous place

Timing

The health effects associated with the Phase II contaminants are generally of a non-acute (chronic) nature, except for nitrate* and nitrite* which are of acute concern. The type and nature of the violation determines the time frame under which public notification must occur. The following is an explanation of when notices are to be issued (see Table 1 for additional clarification):

*Note: Immediate public notification is required if an acute violation for nitrate or nitrite has occurred and a confirmation sample cannot be obtained within 24 hours. (See Nitrate and Nitrite Fact Sheets for a discussion of confirmation samples and compliance determinations.)

Tier 1

Within 72 hours: Tier 1 acute violations: All systems must notify the public by radio or television of the presence of nitrate/nitrite. TWS and NTWS may instead notify via hand delivery or continuous posting.

Within 14 days: Tier 1 acute and non-acute violations: All systems must issue initial notification of Tier 1 non-acute violations and follow-up newspaper notices for Tier 1 acute violations. TWS and NTWS may instead notify via hand delivery or continuous posting.

and,

Within 45 days: Tier 1 acute and non-acute violations: CWS must issue follow-up notices via direct mail, in customer water bills, or by hand delivery. TWS and NTWS may make follow-up notice via hand delivery or continuous posting.

Note: A copy of the most recent public notice must be given to all new billing units or hookups prior to or at the time service begins for existing Tier 1 acute and non-acute violations.

Tier 1 and Tier 2

Within 3 months: Tier 2 violations: CWS must issue notices via newspaper. TWS and NTWS may issue notices via hand delivery or by continuous posting for the duration of the violation.

Repeated every 3 months: All systems must repeat the public notice every three months for Tier 1 acute, Tier 1 non-acute, and Tier 2 violations for as long as the violation, variance or exemption exists by using direct mail, hand delivery, or continuous posting methods. Note: For acute Tier 1 violations, electronic media and newspaper notices are not repeated and for non-acute Tier 1 violations, newspaper notices are not repeated.

Table 1. Summary of Public Notification Requirements

Violation Category Type	Mandatory Health Effects Information Required (All PWSs)	Notice to New Billing Units (CWSs Only)	Type of PWS	Time Frame Within Which Notice Must be Given (Box Indicates time frame for initial notice, and is followed by the frequency on repeat notice until the violation is resolved)
				Viola-tion / 72 hours / 7 days / 14 days / 45 days / 3 months / Annual
TIER 1			Community	Acute Violations:
1. MCL	Yes	Yes		TV and Radio — No Repeat
2. Treatment Technique	Yes	Yes		Newspaper[1] — No Repeat
				Mail or Hand Delivery[2] — Quarterly Repeat
3. Variance or Exemption Schedule Violation	Yes	Yes		Non-Acute Violations:
				Newspaper[1] — No Repeat
				Mail or Hand Delivery[2] — Quarterly Repeat
			Non-community[3]	Option 1: **Notice as for Community Water Systems** or Option 2:
				Acute Violations: Posting or Hand Delivery — Continuous/Quarterly Repeat[5]
				Non-Acute Violations: Posting or Hand Delivery — Continuous/Quarterly Repeat[5]
Tier 2				
1. Monitoring[4]	No	No	Community	Newspaper[1] — Quarterly Repeat by Mail or Hand Delivery
2. Testing Procedure	No	No		
3. Variance or Exemption Issued	Yes	No	Non-community[3]	Option 1: **Notice as for Community Water Systems** or Option 2: Posting or Hand Delivery — Continuous/ Quarterly Repeat[5]

[1] If no newspaper of general circulation is available, posting or hand delivery is required as specified in §141.32(a)(3)(i) and §141.32(b)(3)(i).

[2] May be waived in accordance with §141.32(a)(1)(ii).

[3] Includes both transient non-community public water systems and non-transient non-community public water systems.

[4] Less frequent notice (but no less than annual) to be required as in §142.16(a).

[5] Continuous repeat required if posting is used, quarterly repeat required if hand delivery is used.

Source: *General Public Notification for Public Water Systems* (EPA 570/9-89-002, September 1989. p. 1-3).

Treatment Options

EPA Phase II Fact Sheet Series (12 of 14)

October 1991

This fact sheet identifies the Best Available Technology (BAT) and summarizes the conditions for variances and exemptions to be issued for contaminants listed under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. The Phase II National Primary Drinking Water Regulations (NPDWRs) take effect on July 30, 1992, except for aldicarb, aldicarb sulfoxide, aldicarb sulfone, barium, and pentachlorophenol. The NPDWRs for the latter five contaminants take effect on January 1, 1993.

Permanent Treatment Options

Organic Chemicals

- EPA has approved best available technology (BAT) treatments to achieve the maximum contaminant levels (MCLs) for the organic chemicals identified in the Phase II Rule. The approved BATs are either packed tower aeration, granular activated carbon, or both, as indicated in Table 1.
- The systems affected by the Phase II organic contaminant MCLs are community and nontransient, noncommunity water systems (CWS and NTWS, respectively).

Inorganic Chemicals

- EPA has approved various BATs to achieve the MCLs for the eight inorganic chemicals. These BATs are indicated in Table 1.
- The systems affected by the Phase II inorganic contaminant MCLs are CWS and NTWS, with the exception of Nitrate and Nitrite. The Phase II MCLs for these two contaminants affect all public water systems including transient water systems.

Systems Affected By Phase II MCLs

Chemical	Systems Affected
Pesticides	CWS and NTWS
PCBs	
Volatile Organic Chemicals	
Inorganic Chemicals	
Nitrate	All Public Water Systems*
Nitrite	

*Transient Water Systems included.

Table 1. Best Available Technologies, Removal Efficiencies, and Estimated Costs for Phase II Chemicals

Chemical Group	BAT	% Efficiency	Estimated Cost Ranges[1] In Cents/1000 gallons (system size by population served) 25-100	3300-10,000	>1 million
Organics					
Volatile Organics					
	Granular Activated Carbon	—	910-950	36-76	14-19
	Packed Tower Aeration	—	130-325	9-60	6-41
Pesticides and PCBs[2]					
	Granular Activated Carbon	—	910-930	36-51	10-14

Table 1. Best Available Technologies, Removal Efficiencies, and Estimated Costs for Phase II Chemicals (continued)

Chemical Group / BAT	% Efficiency	Estimated Cost Ranges[1] in Cents/1000 gallons (system size by population served) 25-100	3300-10,000	>1 million
Inorganics				
Conventional Technologies[3]				
Coagulation/ Filtration	80-99	N/A[4]	19-52	3-34
Lime Softening	45-99	N/A[4]	9-130	1-61
Additional Technologies[5]				
Electrodialysis Reversal	51-94	150-590	35-210	17-150
Ion Exchange	75-99	200-340	38-54	13-77
Reverse Osmosis	67-99	150-620	120-220	17-150
Asbestos				
Corrosion Control	90	34-200	4-13	1-5
Diatomite Filtration	95	130	18	8
Direct Filtration	70-99	520	30	12
Optional for Mercury				
Granular Activated Carbon	80-100	200	52	31
Optional for Selenium				
Activated Alumina	85-95	410	19	6

[1] Actual costs and efficiencies will largely depend upon type of contaminant, but special conditions may also apply to some figures. See the *Federal Register*, January 30, 1991, p. 3552, for more details.

[2] For Ethylene dibromide and Dibromochloropropane, Packed Tower Aeration is also BAT.

[3] Coagulation/Filtration is BAT for all Phase II inorganics except Barium, Nitrate, Nitrite, and Selenium VI. Lime softening is BAT for all inorganics except Asbestos, Chromium VI, Nitrate, and Nitrite.

[4] Not BAT for variance purposes for systems with <500 service connections.

[5] Electrodialysis Reversal is BAT for Barium, Nitrate, and Selenium IV. Ion Exchange is BAT for all Phase II inorganics except Nitrate and Selenium IV. Reverse Osmosis is BAT for all Phase II inorganics except Asbestos.

Non-Treatment Options

Variances

- Under Phase II, states may issue a variance for any system unable to fully comply with all applicable drinking water regulations *after installation of BAT*. The variance may only be granted if the system cannot meet the requirements by joining another water system or by developing another water source.
- If a system can demonstrate through comprehensive engineering assessments that BAT would achieve only a *de minimis* reduction in contaminant levels, the state may issue a variance without requiring BAT installation. If a variance is granted, the state must establish a compliance schedule requiring the system to investigate the suitability of other treatment technologies. If, in the state's opinion, a feasible treatment technology is found for the system operating under a variance, the state may require the system to install and/or use the treatment in connection with a compliance schedule.

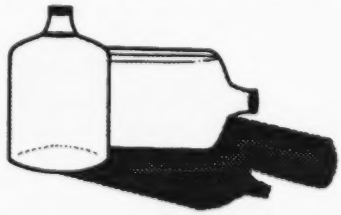
- Variances must not pose an unreasonable risk to human health (URTH). EPA has specified acceptable risk levels (i.e., URTH) for each of the Phase II contaminants.

Exemptions

- A state may issue an exemption of up to three years, provided an URTH level will not be exceeded. The state may grant an exemption based on factors such as:
  1) economic limitations;
  2) the system was in operation on the effective date of the Phase II National Primary Drinking Water Regulations (NPDWRs), or no reasonable alternative water source is available for those systems brought into operation after the effective date of the NPDWRs.
- Exemptions may be extended for one or more two-year periods for systems with not more than 500 service connections and that need financial assistance for necessary improvements. However, states granting exemptions based on affordability should require small water systems to remain current with available new technologies and apply new low-cost technologies where appropriate.
- For systems with more than 500 service connections, exemptions may be extended for a period of not more than the initial three years if compliance has not been achieved within 12 months after the date of issuance.
- EPA has developed a "rule of thumb" that reflects both affordable high quality water and the established federal policy with regard to economic hardship. EPA considers a total annual water bill of less than or equal to two percent of the median household income (about $650/household/year) to be affordable if calculated based on median national income. Above this threshold, the discretion is left to the states to determine water that is affordable.
- The state must decide which treatment techniques should be required to provide the greatest risk reduction for those systems requiring more than one treatment technique and having limited funds.

Short-Term Treatment Options

- A state may require a system to provide either bottled water, point-of-use (POU) devices or point-of-entry (POE) devices to the public as interim control measures to avoid an URTH during a variance or exemption period.
- If bottled water is used as a condition for receiving a variance or exemption, the system must put in place a monitoring program that ensures that the finished product meets all MCLs. The system must monitor a representative sample of the bottled water for the Phase II contaminants. In addition, the system must receive a certification from the bottled water company that the bottled water supplied has been taken from an "approved source" as defined under the regulations. The public water system must ensure that there is sufficient bottled water available to meet the needs of the public being served via door-to-door bottled water delivery.



- If POU and/or POE devices are used as a condition for obtaining a variance or exemption, the public water system is responsible for:
  1) the operation and maintenance of any device used,
  2) following a state-approved monitoring plan that ensures health protection equivalent to central treatment, and
  3) following a state-approved plan to ensure that the POU/POE technologies being used maintain the microbiological safety of the water at all times.
- The state is responsible for:
  1) requiring adequate certification of performance and field testing of each device; requiring a rigorous engineering design review of each device if not included in the product's certification process;
  2) reviewing the design and application of each device considering the potential for increasing heterotrophic bacteria concentrations as a result of treatment with activated carbon; and
  3) ensuring that buildings connected to the system have sufficient POU or POE devices that are properly installed, maintained and monitored for consumer protection.
- In addition to being a short-term treatment option, POE devices may be permanently installed to meet the Phase II MCL requirements if the above requirements are met on a continuous basis.

For Additional Information

- To assist the small systems that will need to install treatment to comply with the Phase II Rule, EPA has initiated a Technology and Training Support Program. This program has been designed to identify, develop, and make available alternative drinking water technologies for small systems which are relatively inexpensive and simple to operate. The program is identified in the *Drinking Water Mobilization Coordinators' Handbook* (U.S. EPA, Office of Water, September 1990). For current information concerning this initiative, contact EPA's Safe Drinking Water Hotline at 1-800-426-4791.

EPA Cost and Regulatory Impact

EPA Phase II Fact Sheet Series (13 of 14)

October 1991

This fact sheet summarizes the economic impacts associated with the U.S. Environmental Protection Agency's (EPA) Phase II Rule. EPA conducts regulatory impact analyses for each major regulation. The analyses consider the incremental impacts associated with a given regulation on various sectors of society. The impacts assessed under the Phase II Rule include water system compliance costs, state drinking water program implementation costs, and public health benefits.

Systems Affected by Phase II

EPA estimates that 3300 community and nontransient, noncommunity water systems (CWS and NTWS, respectively) will violate the Phase II maximum contaminant levels (MCLs).

- Of this number, approximately 3110 will need to install treatment to meet the MCLs for synthetic organic chemicals (SOCs), including:
  - — 825 systems exceeding the MCL for pentachlorophenol, and
  - — 2300 systems exceeding the MCLs for atrazine, alachlor, aldicarb, ethylene dibromide, dibromochloropropane and 1,2-dichloropropane.
- For the regulated inorganic chemicals (IOCs), 165 systems will need to install treatment to meet the more stringent MCL for cadmium. Other inorganic MCLs are the same as, or higher than, the current interim MCLs, and no additional impact is expected.

Benefits of the Rule

Compliance with the Phase II regulations is expected to provide reduced exposure to almost three million people, including 2.7 million people presently exposed to SOCs and 200,000 people exposed to IOCs. The health benefits of this reduced exposure are:

- the prevention each year of about 72 cancer cases related to SOC exposure, mainly exposure to ethylene dibromide and dibromochlorophenol; and
- the avoidance of chronic toxic effects, primarily kidney toxicity related to cadmium exposure.

Annual Compliance Costs

Based on the number of systems affected, the Phase II Rule will result in ***incremental*** compliance costs to the nation of about $88 million per year (annualized at three percent).

- $64 million will be required for treatment and waste disposal ($57 million for SOCs and $7 million for IOCs).

- $24 million will be required for monitoring ($21 million for SOCs and $2.5 million for IOCs).
- Generally less than $10 per household per year will be required for monitoring, though these costs could be considerably higher for small systems.
- EPA estimates that household costs associated with treatment and monitoring for the Phase II SOCs will range from $31 to $598 and from $122 to $896 for the Phase II IOCs. Individual system costs will vary depending on system size (see Table 1 for distribution of maximum household costs by system size).

Table 1. Maximum Household Costs (in Dollars per house per year)

System Size (Population served)	SOCs[1]	IOCs[2]
25-100	$598	$ 896
101-500	233	442
3300-10,000	64	122
25,000-50,000	42	167
over 1,000,000	31	205

[1] Granular Activated Carbon
[2] Weighted average based on probabilities associated with treatment options (i.e., conventional, lime softening, ion exchange, reverse osmosis and others)

Unregulated Contaminant Monitoring Costs

The one-time monitoring costs, between 1993 and 1995, associated with the Phase II unregulated contaminants is estimated to be $39 million. The costs are attributed primarily to the unregulated SOCs.

State Implementation Costs

Costs to state programs are estimated to be about $21 million initially and $17 million annually in subsequent or out-years (after the initial start-up period).

- Over half of these initial and out-year costs are expected to be associated with expanding laboratory capabilities.
- The remainder will support a variety of other state efforts such as the development of vulnerability criteria, revision of primacy agreements, staff training, data management system modifications, public education and enforcement, with each of these efforts expected to require initial allocations of $1 million nationwide.
- Enforcement and public education are expected to require most of the remaining out-year costs.

Table 2. Summary National Cost Estimates for Final Phase II Rule

	SOC Estimates	IOC Estimates	Rounded Total
Systems in Violation	3110	165	3300
Costs ($M/yr):			
Annual Compliance Costs	78	10	88
- Monitoring	21	2.5	24
- Treatment ($M/yr) (includes Capital, O & M and Waste Disposal Costs @ 3%)	57	7.0	64
Unregulated Contaminant Costs ($M)	39	0.1	39
State Implementation Costs			
- Initial ($M)	—	—	21
- Out-year ($M/yr)	—	—	17
Benefits:			
Population with Reduced Exposure (millions)	2.7	0.2	3
Reduced Cancer Cases per Year	72	—	72

EPA Secondary Standards

EPA Phase II Fact Sheet Series (14 of 14)

October 1991

This fact sheet summarizes the National Secondary Drinking Water Regulations (NSDWRs) for aluminum and silver and the Threshold Odor Number (TON) as promulgated under the U.S. Environmental Protection Agency's (EPA) Phase II Rule. It also summarizes taste and odor guidance provided for various organic chemicals that may be detectable in drinking waters. The NSDWRs will take effect on July 30, 1992.

Secondary Maximum Contaminant Levels (SMCLs):

Inorganics *[see sidebar for SMCLs]*

Aluminum has been associated with discoloration of drinking water under certain conditions following treatment and during distribution. This is believed to result from post-precipitation following treatment which causes turbidity. Since water quality and treatment conditions vary, the SMCL is issued as a range which gives states the flexibility to set appropriate levels on either a regional or local basis.

The oral ingestion of **silver** has been associated with the cosmetic effect argyria which is a discoloration of the skin. Silver has, however, no effect on the taste, odor, or appearance of water. Silver is frequently used as a bacteriostatic agent in private home water treatment devices. To prevent the potential cosmetic effects of argyria from the combination of the possible low levels of silver in drinking water and of silver found in treatment devices, EPA has issued a SMCL.

Threshold Odor Number (TON) *[see sidebar for SMCL]*

The SMCL established for odor remains at 3 TON. EPA urges utilities to meet the current standard, thus providing finished water with more pleasing odor characteristics. Consumers associate taste and odor with potential harmful substances. Utilities should consider this association an important priority in maintaining consumer acceptance of their water.

Regulated Contaminants

Contaminant	SMCL
Aluminum	0.05 mg/L to 0.2 mg/L
Silver	0.1 mg/L
Odor	3 TON

Guidelines for Taste and Odor Levels for Certain Organic Chemicals

Contaminant	Guideline
o-Dichlorobenzene	0.01 mg/L
p-Dichlorobenzene	0.005 mg/L
Ethylbenzene	0.03 mg/L
Pentachlorophenol	0.03 mg/L
Styrene	0.01 mg/L
Toluene	0.04 mg/L
Xylene	0.02 mg/L

Guidelines

Organic Taste and Odor Notice *[see sidebar for guidelines]*

EPA decided to defer issuing SMCLs that were proposed for seven organic chemicals in the Phase II Rule based on insufficient experimental evidence and lack of supporting published literature to support such levels as being generally adverse. Instead, EPA is notifying officials and consumers of the concentrations at which tastes and/or odors may be detected.